

AGENDA – AS AMENDED

**CITY COUNCIL, NORMAN UTILITIES AUTHORITY, NORMAN MUNICIPAL AUTHORITY,
AND NORMAN TAX INCREMENT FINANCE AUTHORITY**

It is the policy of the City of Norman that no person or groups of persons shall on the grounds of race, color, religion, ancestry, national origin, age, place of birth, sex, sexual orientation, gender identity or expression, familial status, marital status, including marriage to a person of the same sex, disability, retaliation, or genetic information, be excluded from participation in, be denied the benefits of, or otherwise subjected to discrimination in employment activities or in all programs, services, or activities administered by the City, its recipients, sub-recipients, and contractors. In the event of any comments, complaints, modifications, accommodations, alternative formats, and auxiliary aids and services regarding accessibility or inclusion, please contact the ADA Technician at 405-366-5424, Relay Service: 711. To better serve you, five (5) business days' advance notice is preferred.

You are required to sign up in advance of the meeting on the City's webpage, by calling the City Clerk's Office (405-366-5406), or at the Council Chambers prior to the start of the meeting with your name, ward, and item you wish to speak to including whether you are a proponent or opponent. When the time comes for public comments, the Clerk will call your name and you can make your way to the podium. Comments may be limited on items of higher interest, if so, the Mayor will announce that at the beginning of the meeting. Participants may speak one time only up to 3 minutes per person per item. There will be no yielding of time to another person. Sign up does not guarantee you will get to speak if the allotted time for that item has already been exhausted. If there is time remaining after those registered to speak have spoken, persons not previously signed up may have the opportunity to speak. Comments received must be limited to the motion on the floor only.

CALL TO ORDER

ROLL CALL

PLEDGE OF ALLEGIANCE

APPROVAL OF MINUTES

1. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE MINUTES AS FOLLOWS:

CITY COUNCIL MINUTES OF NOVEMBER 22, 2022

NORMAN UTILITIES AUTHORITY MINUTES OF NOVEMBER 22, 2022

NORMAN MUNICIPAL AUTHORITY MINUTES OF NOVEMBER 22, 2022

NORMAN TAX INCREMENT FINANCE AUTHORITY MINUTES OF NOVEMBER 22, 2022

AWARDS AND PRESENTATIONS

2. CONSIDERATION OF RECOGNITION OF PARTICIPANTS OF THE NORMAN CHAMBER OF COMMERCE TOMORROW'S LEADERS PROGRAM.

PROCLAMATIONS

3. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-9: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, DECLARING FRIDAY, FEBRUARY 17, 2023, AS RANDOM ACTS OF KINDNESS DAY IN THE CITY OF NORMAN.
4. CONSIDERATION OF ACKNOWLEDGMENT, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-10: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, PROCLAIMING THE MONTH OF FEBRUARY, 2023, AS BLACK HISTORY MONTH IN THE CITY OF NORMAN.

COUNCIL ANNOUNCEMENTS

CONSENT DOCKET

This item is placed on the agenda so that the City Council, by unanimous consent, can designate those routine agenda items that they wish to be approved or acknowledged by one motion. If any item proposed does not meet with approval of all Councilmembers, that item will be heard in regular order. Staff recommends that Item 5 through Item 24 be placed on the consent docket.

First Reading Ordinance

5. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-22 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE LOT ONE (1), BLOCK ONE (1), OF HISTORIC BERRY FARMS ADDITION, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE CO, SUBURBAN OFFICE COMMERCIAL DISTRICT, AND R-3, MULTI-FAMILY DWELLING DISTRICT, AND PLACE SAME IN THE SPUD, SIMPLE PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (1300 WEST LINDSEY STREET)
6. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-24 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING ARTICLE I OF CHAPTER 16 (PUBLIC IMPROVEMENTS) OF THE CODE OF THE CITY OF NORMAN BY ADOPTING AND INCORPORATING BY REFERENCE THEREIN THE CITY OF NORMAN STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS AND THE ENGINEERING DESIGN CRITERIA FOR STREETS, STORMWATER, WATER LINES, AND SANITARY SEWERS DATED FEBRUARY 28, 2023, PROVIDING ENFORCEMENT REMEDIES INCLUDING PENALTIES FOR VIOLATION; AND PROVIDING FOR THE SEVERABILITY THEREOF.

7. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF ORDINANCE O-2223-25 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 8-503 OF THE CODE OF ORDINANCES CONTINGENT ON VOTER APPROVAL OF ORDINANCE O-2223-26 TO INCREASE THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS; PROVIDING FOR AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.
8. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF ORDINANCE O-2223-26 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AUTHORIZING THE CALLING AND HOLDING OF A SPECIAL ELECTION IN SAID CITY OF NORMAN, STATE OF OKLAHOMA, (THE CITY), ON THE NINTH DAY OF MAY, 2023, FOR THE PURPOSE OF SUBMITTING TO THE REGISTERED, QUALIFIED ELECTORS OF SAID CITY THE QUESTION OF APPROVING OR REJECTING ORDINANCE O-2223-25, WHICH ORDINANCE AMENDS SECTION 8-503 OF CHAPTER 8 OF THE CODE OF ORDINANCES OF THE CITY OF NORMAN, OKLAHOMA, BY INCREASING THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS BY THREE PERCENT (3%) TO A TOTAL OF EIGHT PERCENT (8%); PROVIDING AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.

Reports/Communications

9. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE CITY MANAGER'S CONTRACT AND CHANGE ORDER REPORT.
10. CONSIDERATION OF ACKNOWLEDGEMENT, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE NORMAN CONVENTION AND VISITORS BUREAU, INC., (VISIT/NORMAN) ANNUAL REPORT FROM JUNE 30, 2021, THROUGH JUNE 30, 2022.

Authorization for Purchase

11. CONSIDERATION OF AUTHORIZATION, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT FOR THE PURCHASE OF THREE (3) SIDE LOAD SANITATION VEHICLES FROM J&R EQUIPMENT AND RUSH TRUCK CENTER IN THE AMOUNT OF \$1,560,000 UTILIZING OKLAHOMA STATE CONTRACT NUMBERS SW197 AND SW0035T, RESPECTIVELY, AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.

Bids

12. CONSIDERATION OF AWARDING, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID 2223-43: SUBMITTED BY CARGILL IN THE AMOUNT OF \$257 PER TON FOR THE PURCHASE OF SALT FOR THE WATER TREATMENT FACILITY.

Acceptance of Funds

13. CONSIDERATION OF ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A WATERSMART GRANT IN THE AMOUNT OF \$2,000,000 AS ADMINISTERED BY THE BUREAU OF RECLAMATION FOR USE ON THE ADVANCED WATER METERING PROJECT TO BE COMPLETED BY THE UTILITIES DEPARTMENT AND BUDGET APPROPRIATIONS AS OUTLINED IN THE STAFF REPORT.

Easement

14. CONSIDERATION OF GRANTING, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF EASEMENT E-2223-24: GRANTING AN EASEMENT TO OKLAHOMA GAS AND ELECTRIC COMPANY TO PROVIDE ELECTRICAL SERVICE TO THE NEW YOUNG FAMILY ATHLETIC CENTER LOCATED EAST OF 24TH AVENUE N.W. AND SOUTH OF ROCK CREEK ROAD.

Final Plat

15. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF FINAL PLAT FP-2223-9: A FINAL PLAT AND SITE PLAN FOR TAKE FIVE NORMAN ADDITION. (LOCATED AT THE SOUTHWEST CORNER OF THE INTERSECTION OF CLASSEN BOULEVARD AND CEDAR LANE ROAD).

Contracts

16. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF FINAL ACCEPTANCE OF CONTRACT K-2021-35: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND FLINTCO, INC., FOR THE NORTH BASE COMPLEX PROJECT, PHASE 1, AND FINAL PAYMENT IN THE AMOUNT OF \$227,443.96.
17. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AND/OR POSTPONEMENT OF AMENDMENT NO. THREE TO CONTRACT K-2122-81 BY AND BETWEEN THE NORMAN MUNICIPAL AUTHORITY AND CROSSLAND CONSTRUCTION COMPANY, INC., ESTABLISHING THE GUARANTEED MAXIMUM PRICE IN THE AMOUNT OF \$568,189 FOR PHASE 6-B OF THE GRIFFIN PARK REMODEL PROJECT.

18. CONSIDERATION OF AWARDING, APPROVAL, ADOPTION, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID 2223-36 AND CONTRACT K-2223-72: A CONTRACT BY AND BETWEEN CITY OF NORMAN AND STRONGHOLD CONSTRUCTION L.L.C., IN THE AMOUNT OF \$875,334, PERFORMANCE BOND B-2223-42, STATUTORY BOND B-2223-43, MAINTENANCE BOND MB-2223-39, FOR THE TRANSIT CENTER REMODEL PROJECT, RESOLUTION R-2223-71 GRANTING TAX-EXEMPT STATUS, AND BUDGET TRANSFER AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.
19. CONSIDERATION OF ACCEPTANCE, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A FEDERAL TRANSIT ADMINISTRATION 5303 FUNDING GRANT IN THE AMOUNT OF \$40,000 THROUGH THE ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS (ACOG) TO BE USED FOR ELIGIBLE TRANSIT PLANNING ACTIVITIES WITHIN THE CENTRAL OKLAHOMA TRANSPORTATION MANAGEMENT AREA (TMA) AS IDENTIFIED IN THE FY2023 UNIFIED PLANNING WORK PROGRAM (UPWP) AND, APPROVAL OF CONTRACT K-2223-112 WITH DEPOSIT OF FUNDS AS OUTLINED IN THE STAFF REPORT.
20. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF AMENDMENT NUMBER ONE TO CONTRACT K-2122-88: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, THE NORMAN MUNICIPAL AUTHORITY, AND CROSSLAND CONSTRUCTION COMPANY, INC., INCREASING THE CONTRACT AMOUNT BY \$13,916,603 FOR A REVISED CONTRACT AMOUNT OF \$13,948,853 TO PROVIDE CONSTRUCTION MANAGEMENT AT RISK SERVICES FOR THE EMERGENCY COMMUNICATIONS AND OPERATIONS CENTER (ECOC) AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.

Resolutions

21. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2122-75: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AND THE NORMAN MUNICIPAL AUTHORITY APPROPRIATING \$114,164 FROM THE CAPITAL OUTLAY PORTION OF THE CAPITAL FUND BALANCE TO BE USED FOR THE PURCHASE OF NEW GOLF CARTS FOR WESTWOOD GOLF COURSE.
22. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-95: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$11,037 FROM THE ANIMAL WELFARE DONATION ACCOUNT TO BE USED TO PURCHASE SURGICAL INSTRUMENTS AND SUPPLIES FOR THE 2023 ANIMAL WELFARE EXPO SPAY/NEUTER AND VACCINATION CLINIC.
23. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-96: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA APPROPRIATING \$76,250 FROM THE ROOM TAX FUND BALANCE TO BE USED BY THE NORMAN CONVENTION AND VISITORS BUREAU (NCVB) D/B/A VISITNORMAN TO PAY A PORTION OF THE COSTS FOR FOUR STRATEGIC PLANS DESIGNED TO PROMOTE TOURISM IN NORMAN.

24. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-97: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, APPROPRIATING \$265,777 FROM THE GENERAL FUND BALANCE TO FUND THE NET REVENUE STABILIZATION FUND (RAINY DAY FUND) AT ITS PROJECTED TARGETED LEVEL.

NON-CONSENT ITEMS

Second Reading Ordinance

25. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-21 UPON SECOND AND FINAL READING: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE PART OF SECTION TWENTY-TWO (22), TOWNSHIP EIGHT NORTH (8N), RANGE ONE WEST (1W), OF THE INDIAN MERIDIAN, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE A-2, RURAL AGRICULTURAL DISTRICT, AND PLACE SAME IN THE PUD, PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (LOT 1 OF ROLL TOP RANCH COS-0708-5 – 10001 ETOWAH ROAD)
26. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-24 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING AND ENACTING A NEW CODE FOR THE CITY; PROVIDING FOR THE REPEAL OF CERTAIN ORDINANCES NOT INCLUDED THEREIN; PROVIDING A PENALTY FOR THE VIOLATION THEREOF; PROVIDING FOR THE MANNER OF AMENDING SUCH CODE; AND PROVIDING WHEN SUCH CODE AND THIS ORDINANCE SHALL BECOME EFFECTIVE; AND PROVIDING FOR THE SEVERABILITY THEREOF.

Request to Release Cash Surety for Deferred Construction

27. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A REQUEST TO RETURN A CASH SURETY FOR DEFERRED CONSTRUCTION FOR PAVING IMPROVEMENTS IN CONNECTION WITH FOUNTAIN VIEW ADDITION, SECTION 1. (GENERALLY LOCATED ¼ MILE SOUTH OF WEST TECUMSEH ROAD ON THE EAST SIDE OF 48TH AVENUE NW).

MISCELLANEOUS COMMENTS

This is an opportunity for citizens to address City Council. Due to Open Meeting Act regulations, Council is not able to participate in discussion during miscellaneous comments. Remarks should be directed to the Council as a whole and limited to three minutes or less.

ADJOURNMENT

File Attachments for Item:

1. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE MINUTES AS FOLLOWS:

CITY COUNCIL MINUTES OF NOVEMBER 22, 2022

NORMAN UTILITIES AUTHORITY MINUTES OF NOVEMBER 22, 2022

NORMAN MUNICIPAL AUTHORITY MINUTES OF NOVEMBER 22, 2022

NORMAN TAX INCREMENT FINANCE AUTHORITY MINUTES OF NOVEMBER 22, 2022



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Brenda Hall, City Clerk

PRESENTER: Brenda Hall, City Clerk

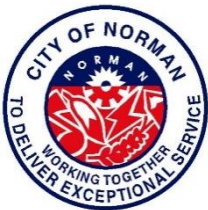
ITEM TITLE: CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR
POSTPONEMENT OF THE MINUTES AS FOLLOWS:

CITY COUNCIL MINUTES OF NOVEMBER 22, 2022

NORMAN UTILITIES AUTHORITY MINUTES OF NOVEMBER 22, 2022

NORMAN MUNICIPAL AUTHORITY MINUTES OF NOVEMBER 22, 2022

NORMAN TAX INCREMENT FINANCE AUTHORITY MINUTES OF
NOVEMBER 22, 2022



CITY OF NORMAN, OK CITY COUNCIL REGULAR MEETING

Municipal Building, Council Chambers, 201 West Gray, Norman, OK 73069
Tuesday, November 22, 2022 at 6:30 PM

MINUTES

It is the policy of the City of Norman that no person or groups of persons shall on the grounds of race, color, religion, ancestry, national origin, age, place of birth, sex, sexual orientation, gender identity or expression, familial status, marital status, including marriage to a person of the same sex, disability, retaliation, or genetic information, be excluded from participation in, be denied the benefits of, or otherwise subjected to discrimination in employment activities or in all programs, services, or activities administered by the City, its recipients, sub-recipients, and contractors. In the event of any comments, complaints, modifications, accommodations, alternative formats, and auxiliary aids and services regarding accessibility or inclusion, please contact the ADA Technician at 405-366-5424, Relay Service: 711. To better serve you, five (5) business days' advance notice is preferred.

CALL TO ORDER

Mayor Heikkila called the Meeting to Order at 6:30 p.m.

ROLL CALL

PRESENT

Mayor Larry Heikkila
Councilmember Ward 1 Brandi Studley
Councilmember Ward 2 Lauren Schueler
Councilmember Ward 3 Kelly Lynn
Councilmember Ward 4 Helen Grant
Councilmember Ward 5 Rarchar Tortorello
Councilmember Ward 6 Elizabeth Foreman
Councilmember Ward 7 Stephen Holman
Councilmember Ward 8 Matthew Peacock

PLEDGE OF ALLEGIANCE

Mayor Heikkila led the Pledge of Allegiance.

PROCLAMATIONS

1. CONSIDERATION OF ACKNOWLEDGEMENT, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-7: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, PROCLAIMING SATURDAY, NOVEMBER 26, 2022, AS SMALL BUSINESS SATURDAY IN THE CITY OF NORMAN.

Motion made by Councilmember Ward 8 Peacock, Seconded by Councilmember Ward 6 Foreman.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman

Items submitted for the record

1. Staff Report dated November 22, 2022, from Brenda Hall, City Clerk
2. Proclamation P-2223-7

Participants in discussion

1. Ms. Jennifer Austin, Co-Owner of Occasions Gift Store, accepted the proclamation and thanked the Council

Receipt of the Proclamation was Acknowledged.

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COUNCIL ANNOUNCEMENTS

Bearcat. Councilmember Studley said from 2015 to the present date, there were 37 against and four in favor of buying a Bearcat in Ward 1; Ward 2, 78 against and 7 in favor; Ward 3, 134 against and 39 in favor; Ward 4, 41 against and one in favor; Ward 6, 71 against, 24 in favor, and 2 maybes; and Ward 7, 34 against, 3 in favor, and 1 maybe. She said to put this in perspective, 90% of Ward 1 were against the Bearcat and as a whole, 84% were against the bearcat. She read an email from a constituent who said the majority of the City including the police is against this so why is it coming forward again.

*

Small Business Saturday. Councilmember Schueler said Small Business Saturday is a great way to support all of our small businesses in Norman.

Councilmember Grant said she hoped folks would go to Campus Corner, Downtown, and all of the small businesses.

Councilmember Holman urged residents to go out on this day and spend money at a locally owned Norman business. He said small business has been his employment his entire life and these businesses are the backbone of our community.

Councilmember Peacock urged people to Shop Norman Local.

*

Council Announcements, continued:

Giving Tuesday. Councilmember Schueler said Tuesday, November 28, is “Giving Tuesday” and urged residents to look up some of the non-profits in Norman and donate to them.

*

Appointments. Councilmember Schueler recognized Paula Roberts for continuing to serve on the Norman Regional Hospital Authority.

Councilmember Tortorello thanked Maria Kindel for agreeing to serve on the Planning Commission.

*

Thanksgiving Holiday. Councilmember Schueler reminded people that City Hall will be closed on Thursday, November 24th, and Friday, November 25th, in recognition of the Thanksgiving holiday.

Councilmembers Lynn and Tortorello and Mayor Heikkila wished everyone a Happy Thanksgiving.

Councilmember Holman encouraged everyone to have a wonderful holiday and enjoy the time with families and friends.

*

National American Indian Heritage Month. Councilmember Grant said on August 3, 1990, President George H.W. Bush declared the month of November as National American Indian Heritage Month, commonly referred to as Native American Heritage Month. She said according to the University of Oklahoma, Native American Studies, and websites that map native lands, Norman is located on Caddo, Wichita, Apache, Absentee Shawnee, Kiowa, Kickapoo, and Osage lands. She said 39 tribal nations dwell in the state of Oklahoma as a result of settler and colonial policies designed to assimilate native people. She said Norman was also a Sundown town until 1967.

*

Warming Shelter. Councilmember Foreman said when she arrives at City Hall before a meeting, there are always a number of people at the Warming Shelter waiting to go in. She said she is glad Norman has a space available for them to keep them warm during the winter months. She said this merits further conversation in the future.

*

Community Planning and Transportation Committee (CPTC). Councilmember Holman announced that the CPTC Meeting will be Wednesday, November 23rd, at 4:00 p.m. because of the Thanksgiving holiday. He said the meeting is also streamed on YouTube.

*

Council Announcements, continued:

Comprehensive Plan Update/Strongtowns Committee. Mayor Heikkila asked all Councilmembers to submit four names each for the Comprehensive Plan Update Committee and the Strongtowns Committee to be considered as nominations for those Ad Hoc Committee appointments.

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CONSENT DOCKET

This item is placed on the agenda so that the City Council, by unanimous consent, can designate those routine agenda items that they wish to be approved or acknowledged by one motion. If any item proposed does not meet with approval of all Councilmembers, that item will be heard in regular order. Staff recommends that Item 2 through Item 26 be placed on the consent docket.

Motion made by Councilmember Ward 7 Holman, Seconded by Councilmember Ward 5 Tortorello.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

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APPROVAL OF MINUTES

2. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE MINUTES AS FOLLOWS:

CITY COUNCIL STUDY SESSION MINUTES OF SEPTEMBER 20, 2022
 CITY COUNCIL MINUTES OF SEPTEMBER 27, 2022
 NORMAN UTILITIES AUTHORITY MINUTES OF SEPTEMBER 27, 2022
 NORMAN MUNICIPAL AUTHORITY MINUTES OF SEPTEMBER 27, 2022
 NORMAN TAX INCREMENT FINANCE AUTHORITY MINUTES OF SEPTEMBER 27, 2022

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Item 2, continued:

Items submitted for the record

1. Staff Report dated November 22, 2022, from Brenda Hall, City Clerk
2. City Council Study Session minutes of September 20, 2022
3. City Council minutes of September 27, 2022
4. Norman Utilities Authority minutes of September 27, 2022
5. Norman Municipal Authority minutes of September 27, 2022
6. Norman Tax Increment Finance Authority minutes of September 27, 2022

The Minutes were Approved.

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First Reading Ordinance

3. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-19 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADDING ARTICLE VII "ELECTRIC CHARGING STATIONS" TO CHAPTER 2 OF THE CODE OF THE CITY OF NORMAN, OKLAHOMA, EMPOWERING THE CITY MANAGER OR HIS DESIGNEE TO SET THE PRICE FOR THE USE OF CITY OWNED CHARGING STATIONS BY OTHER GOVERNMENTAL ENTITIES AND THE GENERAL PUBLIC; SETTING FORTH A SIGNAGE REQUIREMENT FOR PARKING SPACES RESERVED FOR CHARGING STATIONS AND RELATED DEFINITIONS; AND PROVIDING FOR THE SEVERABILITY THEREOF.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Michele Loudanback, Environmental and Sustainability Manager
2. Ordinance O-2223-19
3. Legislatively notated copy of Ordinance O-2223-19

Ordinance O-2223-19 was Adopted Upon First Reading by Title.

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Appointments

4. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE MAYOR'S APPOINTMENTS AS FOLLOWS:

NORMAN REGIONAL HOSPITAL AUTHORITY
TERM: 10-31-22 TO 10-31-25: PAULA ROBERTS, WARD 2

PLANNING COMMISSION
TERM: 11-22-22 TO 11-01-25: MARIA KINDEL, WARD 5

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 2 Schueler.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Brenda Hall, City Clerk

Receipt of the Appointments was Acknowledged.

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Reports/Communications

5. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RECEIPT OF THE FINANCE DIRECTOR'S INVESTMENT REPORT AS OF OCTOBER 31, 2022, AND DIRECTING THE FILING THEREOF.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Anthony Francisco, Director of Finance
2. Finance Director's Report as of October 31, 2022

Receipt of the Report was Acknowledged.

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- Item 1.
6. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RECEIPT OF THE MONTHLY DEPARTMENTAL REPORTS FOR THE MONTH OF OCTOBER, 2022.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Stacey Parker, Executive Assistant
2. Monthly Department Reports for the month of October, 2022

Receipt of the Report was Acknowledged.

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7. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, REJECTION, AMENDMENT, AND/OR REJECTION OF RECEIPT OF THE CITY MANAGER'S CONTRACT AND CHANGE ORDER REPORT AND DIRECTING THE FILING THEREOF.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Brenda Hall, City Clerk
2. Memorandum dated November 4, 2022, from Chris Mattingly, Director of Utilities, to Darrel Pyle, City Manager
3. Change Order No. Four to Contract K-1819-44 with Attachment A, Cost Summary Table, and Attachment B, Contractor Back-Up Information

Receipt of the Report was Acknowledged.

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8. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, REJECTION, AMENDMENT, AND/OR REJECTION OF RECEIPT OF THE CITIZENS PUBLIC SAFETY SALES TAX OVERSIGHT COMMITTEE ANNUAL REPORT FOR FYE 2022.

Item 1.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Kimberly Coffman, Budget Manager
2. City of Norman, Oklahoma, Citizen's Public Safety Sales Tax Oversight Committee with Appendix A, Public Safety Sale Tax I Ordinance O-0708-32; Appendix B, Community Oriented Policing Resolution R-0809-125; Appendix C, Public Safety Sales Tax II Ordinance O-1314-33; Appendix D, Public Safety Sales Tax Committee Meeting Schedule and Minutes; Appendix E, Public Safety Sales Tax fund Financial Report; Appendix F, Public Safety Sales Tax II Original Plan; and Appendix G, Public Safety Sales Tax II Fire Apparatus Replacement Schedule

Receipt of the Report was Acknowledged.

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Easements

9. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF PERMANENT EASEMENT E-2223-12: A PERMANENT PUBLIC-RIGHT-OF-WAY AND DRAINAGE EASEMENT DONATED BY LANDMARK STORAGE, L.L.C., TO ALLOW ALLEY CONNECTION ON MCCULLOUGH STREET.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Joseph Hill, Streets Program Manager
2. Easement E-2223-12 with Exhibit A, Location Map and Legal Description
3. Project Location Map

Easement E-2223-12 was Accepted.

* * * * *

10. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF TEMPORARY CONSTRUCTION EASEMENT E-2223-13: A TEMPORARY CONSTRUCTION EASEMENT DONATED BY LANDMARK STORAGE, L.L.C., TO ALLOW ALLEY CONNECTION ON MCCULLOUGH STREET.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Joseph Hill, Streets Program Manager
2. Temporary Easement E-2223-13 with Exhibit A, Location Map and Legal Description
3. Project Location Map

Temporary Easement E-2223-13 was Accepted.

* * * * *

Contracts

11. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF AMENDMENT NO. EIGHT TO CONTRACT K-1516-110: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, THE NORMAN MUNICIPAL AUTHORITY, AND ADG P.C. INCREASING THE CONTRACT BY \$89,965 FOR A REVISED CONTRACT AMOUNT OF \$4,781,563.14 TO PROVIDE PROFESSIONAL PROGRAM MANAGEMENT SERVICES FOR THE NORTH BASE WASH BAY PROJECT/NORTH BASE PHASE II.

Acting as the City of Norman and the Norman Municipal Authority

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Brenda Hall, City Clerk
2. Amendment No. Eight to Contract K-1516-110 with Exhibit A, Basic Services, Exhibit B, Additional Services, and Exhibit C5, Compensation and Schedule of Values

Amendment No. Eight to Contract K-1516-110 was Approved.

* * * * *

12. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF AMENDMENT NO. EIGHT TO CONTRACT K-1617-114: BY AND BETWEEN THE NORMAN MUNICIPAL AUTHORITY (NMA), THE CITY OF NORMAN, AND PDG, L.L.C., D/B/A PLANNING DESIGN GROUP, ADDING THE CITY OF NORMAN AS A PARTY TO THE CONTRACT TO THE SAME EXTENT AS NMA FOR THE PURPOSES OF PDG'S CONSTRUCTION ADMINISTRATION SERVICES, AS APPLICABLE.

Acting as the City of Norman and the Norman Municipal Authority

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Elisabeth Muckala, Assistant City Attorney
2. Amendment No. Eight to Contract K-1617-114

Amendment No. Eight to Contract K-1617-114 was Approved.

* * * * *

13. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, OR POSTPONEMENT OF AMENDMENT NO. ONE TO CONTRACT K-2021-83: A GROUND LEASE FOR PARKING BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND THE UNITED STATES POSTAL SERVICE PROVIDING FOR A REDUCTION OF PARKING SPACES AND PRO RATA REDUCTION OF RENT TO ACCOMMODATE THE MUNICIPAL COMPLEX RENOVATIONS.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Item 13, continued:

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Elisabeth Muckala, Assistant City Attorney
2. Amendment No. One to Contract K-2021-83 with Exhibit A, Location Map

Amendment No. One to Contract K-2021-83 was Approved.

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14. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, OR POSTPONEMENT OF AMENDMENT NO. ONE TO CONTRACT K-2021-85: A GROUND LEASE FOR PARKING BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND THE UNITED STATES POSTAL SERVICE, PROVIDING REPLACEMENT PARKING SPACES TO ACCOMMODATE THE MUNICIPAL COMPLEX RENOVATIONS.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Elisabeth Muckala, Assistant City Attorney
2. Amendment No. One to Contract K-2021-85 with Exhibit A, Location Map

Amendment No. One to Contract K-2021-85 was Approved.

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15. CONSIDERATION OF ACCEPTANCE, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF AMENDMENT NO. ONE TO CONTRACT K-2122-42: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND PARKHILL, SMITH & COOPER, INC. INCREASING THE CONTRACT AMOUNT BY \$12,824 FOR A REVISED CONTRACT AMOUNT OF \$47,190 TO PROVIDE ADDITIONAL DESIGN SERVICES FOR THE MCCULLOUGH STREET AND ALLEY RECONSTRUCTION PROJECT.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Joseph Hill, Streets Program Manager
2. Amendment No. One to Contract K-2122-42 with 2022 Hourly Rate Fee Schedule

Amendment No. One to Contract K-2122-42 was Approved.

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16. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF CHANGE ORDER NO. THREE TO CONTRACT K-2122-48: BY AND BETWEEN THE NORMAN UTILITIES AUTHORITY AND CIMARRON CONSTRUCTION COMPANY, L.L.C., INCREASING THE CONTRACT AMOUNT BY \$39,408.38 FOR A REVISED CONTRACT AMOUNT OF \$2,143,806.38 AND ADDING 98 CALENDAR DAYS TO THE CONTRACT FOR THE PORTER AVENUE PHASE II WATER LINE REPLACEMENT PROJECT, FINAL ACCEPTANCE OF THE PROJECT, AND FINAL PAYMENT IN THE AMOUNT OF \$139,897.45.

Acting as the Norman Utilities Authority

Motion made by Trustee Ward 7 Holman, Seconded by Trustee Ward 3 Lynn.

Voting Yea: Chairman Heikkila, Trustee Ward 1 Studley, Trustee Ward 2 Schueler, Trustee Ward 3 Lynn, Trustee Ward 4 Grant, Trustee Ward 5 Tortorello, Trustee Ward 6 Foreman, Trustee Ward 7 Holman, Trustee Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Rachel Croft, Staff Engineer
2. Change Order No. Three to Contract K-2122-48
3. Completion and Acceptance Recommendation dated November 18, 2022, from J. Bret Cabbiness, P.E., Senior Project Manager, Garver, to Rachel Croft, P.E., The City of Norman
4. Application and Certificate for Payment dated November 9, 2022, in the amount of \$139,897.45 from Cimarron Construction Company
5. Invoice INV29983 dated October 7, 2022, in the amount of \$519.90 from Pioneer Supply
6. Invoice 21432-3521 dated October 7, 2022, in the amount of \$1,640.92 from Paving Materials, Inc.

Item 16, continued:

Items submitted for the record, continued

7. Invoice 295499 dated November 6, 2022, in the amount of \$1,463 from Schwartz Ready Mix
8. Invoice 295550 dated November 6, 2022, in the amount of \$1,330 from Schwartz Ready Mix

Change Order No. Three to Contract K-2122-48 was Approved, the Project was Accepted, and Final Payment in the Amount of \$139,897.45 to Cimarron Construction Company was Approved.

* * * * *

17. CONSIDERATION OF AWARDING, APPROVAL, ACCEPTANCE, ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID-2223-14 AND CONTRACT K-2223-33: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND L5 CONSTRUCTION, L.L.C., IN THE AMOUNT OF \$2,185,500, PERFORMANCE BOND B-2223-25, STATUTORY BOND B-2223-26, AND MAINTENANCE BOND MB-2223-13 FOR THE NORTH BASE COMPLEX PHASE 2 PROJECT; RESOLUTION R-2223-22 GRANTING TAX-EXEMPT STATUS; AND BUDGET TRANSFERS AND AN APPROPRIATION AS OUTLINED IN THE STAFF REPORT.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Paul D'Andrea, Capital Projects Engineer
2. Tabulation of Bids dated June 6, 2022, for the North Base Complex, Phase 2, Vehicle Wash Facility Project
3. Evaluation and Recommendation dated October 28, 2022, from Michael Segroves, AIA/AICP, Project Architect, GSB, Inc., Architects and Planners, to Mr. Paul D'Andrea, Capital Projects Engineer
4. Contract K-2223-33
5. Performance Bond B-2223-25
6. Statutory Bond B-2223-26.
7. Maintenance Bond MB-2223-13
8. Resolution R-2223-22
9. Project location map
10. City Vehicle Wash Facility fact sheet

Bid 2223-14 was Awarded to L5 Construction, L.L.C., Contract K-2122-33 and the Associated Bonds were Approved, Resolution R-2223-22 was Adopted, and Budget Transfers and a Budget Appropriation were Approved.

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18. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF CONTRACT K-2223-53: A PROFESSIONAL SERVICES AGREEMENT BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND STRONG TOWNS, A MINNESOTA NONPROFIT CORPORATION, IN THE AMOUNT OF \$149,875 FOR PARTICIPATION IN THE STRONG TOWNS COMMUNITY ACTION LAB.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Jane Hudson, Director of Planning and Community Development
2. Contract K-2223-53 with Attachment A, Scope of Services, Strong Towns Community Action Lab, Norman, Oklahoma; Attachment B, Project Schedule; Attachment C, Compensation; and Attachment D, Owner's Responsibilities

Contract K-2223-53 with Strong Towns, a Minnesota Nonprofit Corporation, was Approved.

* * * * *

19. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND /OR POSTPONEMENT OF CONTRACT K-2223-66: A CONTRACT BY AND BETWEEN THE NORMAN UTILITIES AUTHORITY AND MR. KIM SMITH, REPRESENTATIVE OF LANDOWNER, JOE S. SMITH TRUST, FOR THE LAND APPLICATION DISPOSAL OF NORMAN WATER RECLAMATION'S BIO-SOLIDS.

Acting as the Norman Utilities Authority

Motion made by Trustee Ward 7 Holman, Seconded by Trustee Ward 3 Lynn.

Voting Yea: Chairman Heikkila, Trustee Ward 1 Studley, Trustee Ward 2 Schueler, Trustee Ward 3 Lynn, Trustee Ward 4 Grant, Trustee Ward 5 Tortorello, Trustee Ward 6 Foreman, Trustee Ward 7 Holman, Trustee Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Steve Hardeman, Utilities Manager, Water Reclamation Facility
2. Contract K-2223-66
3. Location maps

Participants in discussion

1. Ms. Kathryn Walker, City Attorney

Contract K-2223-66 with Mr. Kim Smith, Representative of Landowner, Joe S. Smith Trust, was Approved.

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- Item 1.
20. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF CONTRACT K-2223-67: A CONTRACT BY AND BETWEEN THE NORMAN UTILITIES AUTHORITY AND MR. JASON MASONER FOR LAND APPLICATION DISPOSAL OF NORMAN WATER RECLAMATION'S BIO-SOLIDS.

Acting as the Norman Utilities Authority

Motion made by Trustee Ward 7 Holman, Seconded by Trustee Ward 3 Lynn.

Voting Yea: Chairman Heikkila, Trustee Ward 1 Studley, Trustee Ward 2 Schueler, Trustee Ward 3 Lynn, Trustee Ward 4 Grant, Trustee Ward 5 Tortorello, Trustee Ward 6 Foreman, Trustee Ward 7 Holman, Trustee Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Steve Hardeman, Utilities Manager, Water Reclamation Facility
2. Contract K-2223-67
3. Location map

Participants in discussion

1. Ms. Kathryn Walker, City Attorney

Contract K-2223-67 with Mr. Jason Falconer was Approved.

* * * * *

Resolutions

21. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-62: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, REQUESTING ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS (ACOG) CORONAVIRUS RESPONSE AND RELIEF SUPPLEMENTAL APPROPRIATIONS ACT (CRRSAA) FUNDING IN THE AMOUNT OF \$500,000 TO SUPPLEMENT EXISTING FUNDING FOR THE GRAY STREET TWO-WAY CONVERSION PROJECT.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from David Riesland, Transportation Engineer
2. Resolution R-2223-62

Resolution R-2223-62 was Adopted.

* * * * *

22. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-63: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, DECLARING THAT THE CITY COUNCIL, NORMAN UTILITIES MUNICIPAL AUTHORITY, NORMAN UTILITIES AUTHORITY, AND NORMAN TAX INCREMENT FINANCE AUTHORITY MEETING SCHEDULED FOR DECEMBER 27, 2022, SHALL BE CANCELLED.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Brenda Hall, City Clerk
2. Resolution R-2223-63

Resolution R-2223-63 was Adopted.

* * * * *

23. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-64: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$8,151,615 OF 2019 TRANSPORTATION GENERAL OBLIGATION BOND PROCEEDS FROM THE CAPITAL FUND BALANCE TO BE USED FOR THE GRAY STREET TWO-WAY CONVERSION PROJECT AND THE JAMES GARNER WIDENING PROJECT FROM ACRES STREET TO DUFFY STREET.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Paul D'Andrea, Capital Projects Engineer
2. Resolution R-2223-64
3. Gray Street Two-Way Conversion Project Location Map
4. James Garner Avenue Widening Project Location Map

Resolution R-2223-64 was Adopted.

24. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-65: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN REQUIRING THAT SWEETGRASS PARTNERS, L.L.C., COORDINATE WITH THE OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT) REGARDING THE CONSTRUCTION OF A REQUIRED LEFT-TURN LANE FOR THE PINE CREEK DEVELOPMENT WITHIN ODOT RIGHT-OF-WAY.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from David Riesland, Transportation Engineer
2. Resolution R-2223-65
3. Project Location Map
4. Paving and Drainage Location Plan

Resolution R-2223-65 was Adopted.

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25. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-66: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$536,000 FROM DEDICATED FUNDING EARMARKED AS 2019 TRANSPORTATION BOND FUNDING FROM THE CAPITAL FUND BALANCE TO BE USED FOR THE PORTER AVENUE STREETScape PROJECT.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Paul D'Andrea, Capital Projects Engineer
2. Resolution R-2223-66
3. Project Location Map

Resolution R-2223-66 was Adopted.

26. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-67: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$2,281,034 FROM THE NORMAN FORWARD FUND BALANCE FOR THE JAMES GARNER AVENUE PROJECT FROM ACRES STREET TO FLOOD AVENUE.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Paul D'Andrea, Capital Projects Engineer
2. Resolution R-2223-67
3. Letter dated October 26, 2022, Andy Rieger, Chair, Norman Forward Citizen's Financial Oversight Board, to Honorable City Councilmembers and Honorable Trustees of the Norman Municipal Authority
4. Project Location Map

Resolution R-2223-67 was Adopted.

* * * * *

Approval of the Consent Docket

Motion made by Councilmember Ward 8 Lynn, Seconded by Councilmember Ward 8 Peacock.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

This is the end of the Consent Docket. Item 2 through Item 26 were Approved on the Consent Docket.

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NON-CONSENT ITEMS

27. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-60: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$943,160 FROM THE SEIZURES AND RESTITUTION FUND BALANCE AND AUTHORIZING THE PURCHASE OF CERTAIN PUBLIC SAFETY EQUIPMENT TO BE USED DURING SPECIAL EVENTS, CRITICAL INCIDENTS, SEARCH & RESCUE EVENTS, AND SAFETY EQUIPMENT FOR THE SWAT TEAM AND HAZARDOUS DEVICES UNIT AND DRUG AND CRIME EDUCATION IN THE COMMUNITY.

Motion made by Councilmember Ward 6 Foreman, Seconded by Councilmember Ward 5 Tortorello.

Voting Yea: Mayor Heikkila, Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 3 Lynn, Councilmember Ward 4 Grant, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Items submitted for the record

1. Staff Report dated November 22, 2022, from Ricky Jackson, Deputy Chief of Police
2. Resolution R-2223-60
3. List of State Seizure funds received from March 3, 2016 through August 27, 2019
4. Letter dated June 1, 2022, from Brad Callahan, Manager, Andros Sales, Remotec/Peraton, To Whom It May Concern
5. Sole Manufacturer Statement dated January 6, 2022, from Richard Busbridge, EOD Product Line Director, Med-Eng, L.L.C.

Participants in discussion

1. Mr. Ricky Jackson, Deputy Chief of Police
2. Mr. Darrel Pyle, City Manager
3. Ms. Marguerite Larson, Ward 6, made comments
4. Mr. Stephen Ellis, Ward 4, protestant
5. Ms. Kate Bierman, Ward 4, protestant
6. Mr. Michael Blunck, Ward 2, protestant
7. Ms. Alexandra Penner, Ward 1, protestant
8. Mr. Evan Dunn, Ward 1, protestant
9. Ms. Christina Owen, Ward 4, made comments
10. Ms. Cynthia Rogers, Ward 4, protestant
11. Mr. Alex Lanphere, Ward 2, protestant
12. Mr. Caleb Creed, Ward 5, protestant
13. Ms. Ann Gallagher, Ward 6, proponent
14. Mr. Daniel Munson, Ward 6, proponent
15. Mr. John Scamehorn, Ward 1, proponent
16. Mr. Austin Ball, Ward 1, proponent
17. Mr. Roger Gallagher, Ward 6, proponent
18. Mr. Luigi Polvani made comments
19. Mr. Melvin Pruett, Ward 2, proponent
20. Mr. Gary Barksdale, Ward 8, proponent
21. Ms. Maggie Logue, Ward 5, proponent
22. Mr. Mark Campbell, Ward 4, made comments

Item 27, continued:

Motion to amend Resolution R-2223-60 by using funding from the General Fund Balance instead of the Seizure and Restitution Fund Balance.

Motion made by Councilmember Ward 7 Holman, Seconded by Councilmember Ward 6 Foreman.

Voting Yea: Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 4 Grant, Councilmember Ward 6 Foreman, Councilmember Ward 7 Holman, Councilmember Ward 8 Peacock

Voting Nay: Mayor Heikkila, Councilmember Ward 3 Lynn, Councilmember Ward 5 Tortorello

Resolution R-2223-60 was Amended.

Participants in discussion

1. Mr. Darrel Pyle, City Manager
2. Mr. Anthony Francisco, Director of Finance
3. Ms. Kathryn Walker, City Attorney
4. Mr. John High, Ward 2, proponent
5. Mr. Jonathan Kindel, Ward 5, asked questions
6. Mr. Stephen Ellis, Ward 4, made comments
7. Ms. Teresa Sterling, protestant
8. Mr. Daniel Munson, Ward 6, proponent
9. Mr. Melvin Pruett, Ward 2, made comments
10. Ms. Christina Owen, Ward 4, made comments
11. Ms. Alexandra Penner, Ward 1, proponent
12. Mr. Michael Blunck, Ward 2, proponent
13. Ms. Ann Gallagher, Ward 6, made comments
14. Mr. Jackson Foote, Ward 4, made comments
15. Ms. Maggie Logue, Ward 5, protestant
16. Mr. Paul Wilson, proponent
17. Mr. Luigi Polvani protestant
18. Ms. Hannah Smith, Ward 1, protestant
19. Mr. Evan Dunn, Ward 1, protestant
20. Mr. Robert Campbell, Ward 8, proponent
21. Mr. Ricky Jackson, Deputy Chief of Police

Resolution R-2223-67 was Adopted as Amended.

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28. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-68. A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$353,000 FROM THE GENERAL FUND BALANCE FOR THE PURCHASE OF AN ARMORED ALL-PURPOSE RESCUE "BEARCAT" VEHICLE AND THE ASSOCIATED TRAINING.

Motion made by Councilmember Ward 3 Lynn, Seconded by Councilmember Ward 5 Tortorello.

Participants in discussion

1. Ms. Ann Gallagher, Ward 6, proponent
2. Mr. Chris Christenberry, Ward 5, proponent
3. Mr. Kyle Hurley, Ward 8, proponent
4. Mr. Luigi Polvani, protestant
5. Mr. Lucas Clover, Ward 8, proponent
6. Mr. Scott Dixon, Ward 8, proponent
7. Mr. Jonathan Kindel, Ward 5, proponent
8. Ms. Maggie Logue, Ward 5, proponent
9. Mr. Michael Nash, Ward 5, proponent
10. Ms. Marguerite Larson, Ward 6, protestant
11. Mr. Stephen Ellis, Ward 4, protestant
12. Ms. Christina Owen, Ward 4, protestant
13. Mr. Michael Blunck, Ward 2, protestant
14. Mr. Robert Campbell, Ward 2, made comments
15. Mr. Caleb Creed, Ward 5, protestant
16. Mr. Nick Lillard, Ward 1, protestant
17. Ms. Cynthia Rogers, Ward 4, protestant
18. Mr. Alex Lanphere, Ward 2, protestant
19. Mr. Evan Dunn, Ward 1, protestant
20. Mr. Ricky Jackson, Deputy Chief of Police

Motion to Postpone Resolution R-2223-68 until January 24, 2023.

Motion made by Councilmember Ward 1 Studley, Seconded by Councilmember Ward 7 Holman.

Voting Yea: Mayor Heikkila, Councilmember Ward 3 Lynn, Councilmember Ward 5 Tortorello, Councilmember Ward 6 Foreman, Councilmember Ward 8 Peacock

Voting Nay: Councilmember Ward 1 Studley, Councilmember Ward 2 Schueler, Councilmember Ward 4 Grant, Councilmember Ward 7 Holman

Resolution R-2223-68 was Not Postponed until January 24, 2023.

Participants in discussion

1. Ms. Kate Bierman, Ward 4, proponent
2. Mr. Evan Dunn, Ward 1, proponent
3. Mr. Stephen Ellis, Ward 4, proponent
4. Ms. Alexandra Penner, Ward 1, proponent
5. Mr. John High, Ward 2, proponent
6. Mr. Melvin Pruett, Ward 2, protestant
7. Mr. Paul Wilson, proponent
8. Mr. Alexander Torvi, Ward 6, protestant
9. Mr. Alex Ruggiers, Ward 4, proponent
10. Ms. Brooke Sims, Ward 8, proponent
11. Mr. Michael Blunck, Ward 2, proponent
12. Ms. Cindy Tuccillo, Ward 5, protestant
13. Ms. Teresa Sterling, protestant
14. Mr. Terry Sterling, protestant

Item 28, continued:

Participants in discussion, continued

15. Ms. Maria Kindel, Ward 5, protestant
16. Mr. Mark Campbell, Ward 2, made comments
17. Mr. Luigi Polvani, protestant
18. Mr. Caleb Creed, Ward 5, proponent
19. Ms. Vicky Shattuck, protestant
20. Ms. Christina Owen, Ward 4, protestant
21. Ms. Marguerite Larson, Ward 6, proponent
22. Mr. Alex Lanphere, Ward 2, proponent
23. Ms. Maggie Logue, Ward 5, protestant
24. Ms. Cynthia Rogers, Ward 4, proponent
25. Mr. Lindell Dillon, Ward 6, protestant
26. Ms. William Shattuck, protestant
27. Mr. Roger Gallagher, Ward 6, protestant
28. Mr. Rob Norman, Ward 3, proponent
29. Mr. Steve Lucas, Ward 8, protestant
30. Mr. Michael Nash, Ward 5, proponent
31. Mr. Jeremy Garnand, SWAT Team, protestant
32. Mr. Ricky Jackson, Deputy Chief of Police
33. Mr. Darrel Pyle, City Manager

Resolution R-2223-68 was Adopted.

* * * * *

MISCELLANEOUS COMMENTS

Speaking to Audience. Ms. Rachel Wyatt-Swanson, Ward 8, said she had signed up twice to speak on the Bearcat item and was not called and she would like to file a formal complaint.

Ms. Brenda Hall, City Clerk, said she saw Ms. Wyatt-Swanson's name on Miscellaneous Discussion but not on the Bearcat item. She said she would look into this and get back with her.

Mr. John High said he had a problem with how people signed up to speak and how much time they were given.

*

Bearcat Item. Mr. Steve Ellis, Ward 4, said he was interested in obtaining details about the 65 cases that Norman Police reported had been awarded to their department. He said this evening he filed an Open Records Request with the City Clerk for the case numbers. He said this should have been investigated before the item appeared on the agenda and he hoped City Council would be willing to reconsider the Bearcat item after he has received the information from the Clerk. He was disappointed how the vote turned out.

Ms. Christina Owen, Ward 4, said there are still things that can be done to keep this community united. She would like the City to move backwards in time to 2015 when things were a lot better in many different ways. She is scared to see where we would be in seven more years. She said approving items like this without public input should have citizen oversight.

Miscellaneous Discussion, continued:

Bearcat Item, continued. Mr. Mark Campbell, Ward 4, said when the Bearcat item was discussed the first time, he asked if it would be displayed/paraded on game days and he was told no. He said the name Bearcat was not chosen by accident and in nature, bearcats and bears do not rescue people. He asked if it was a rescue vehicle or is it needed to lessen the risk to the officer.

ADJOURNMENT

The Meeting adjourned at 11:55 p.m.

ATTEST:

City Clerk

Mayor

File Attachments for Item:

2. CONSIDERATION OF RECOGNITION OF PARTICIPANTS OF THE NORMAN CHAMBER OF COMMERCE TOMORROW'S LEADERS PROGRAM.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Brenda Hall, City Clerk

PRESENTER: Brenda Hall, City Clerk

ITEM TITLE: CONSIDERATION OF RECOGNITION OF GRADUATES OF THE
NORMAN CHAMBER OF COMMERCE TOMORROW'S LEADERS
PROGRAM.

File Attachments for Item:

3. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-9: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, DECLARING FRIDAY, FEBRUARY 17, 2023, AS RANDOM ACTS OF KINDNESS DAY IN THE CITY OF NORMAN.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Brenda Hall, City Clerk

PRESENTER: Mayor Breea Clark

ITEM TITLE: CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-9: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, DECLARING FRIDAY, FEBRUARY 17, 2023, AS RANDOM ACTS OF KINDNESS DAY IN THE CITY OF NORMAN.

Proclamation

P-2223-9

A PROCLAMATION OF THE CITY COUNCIL OF
THE CITY OF NORMAN, OKLAHOMA,
DECLARING FRIDAY, FEBRUARY 17, 2023, AS
RANDOM ACTS OF KINDNESS DAY IN THE CITY
OF NORMAN.

- § 1. WHEREAS, Random Acts of Kindness Day is recognized on February 17th as an annual tradition of performing acts of kindness; and
- § 2. WHEREAS, Millions of Americans focus together to change the world, one random act of kindness at a time; and
- § 3. WHEREAS, people of any age can participate in “Random Acts of Kindness” any time, any place, and for the unselfish purpose of spreading goodwill; and
- § 4. WHEREAS, the City of Norman recognizes the value of simple acts of kindness performed without prompting or reason and how these acts can positively impact the performer, the recipient, and the onlooker of the good deed; and
- § 5. WHEREAS, Random Acts of Kindness Day will inspire people in our community to come together to spread joy, hope, and love to friends, family, co-workers, and neighbors; and
- § 6. WHEREAS, Random Acts of Kindness Day possibly impacts lives by extending love and allowing use to be more kind

NOW, THEREFORE, I, MAYOR OF THE CITY OF NORMAN, OKLAHOMA:

- § 7. Do hereby proclaim Friday, February 17, 2023, as Random Acts of Kindness Day in the City of Norman, Oklahoma, and encourage the residents of our community to join me to recognize and perform random acts of kindness.

PASSED AND APPROVED this 14th day of February, 2023.

Mayor

ATTEST:

City Clerk



File Attachments for Item:

4. CONSIDERATION OF ACKNOWLEDGMENT, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-10: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, PROCLAIMING THE MONTH OF FEBRUARY, 2023, AS BLACK HISTORY MONTH IN THE CITY OF NORMAN.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Steve Hardeman

PRESENTER: Steve Hardeman, Utilities Manager, Water Reclamation Center

ITEM TITLE: CONSIDERATION OF ACKNOWLEDGMENT, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF PROCLAMATION P-2223-10: A PROCLAMATION OF THE MAYOR OF THE CITY OF NORMAN, OKLAHOMA, PROCLAIMING THE MONTH OF FEBRUARY, 2023, AS BLACK HISTORY MONTH IN THE CITY OF NORMAN.

Proclamation

P-2223-10

A PROCLAMATION OF THE MAYOR OF THE CITY
OF NORMAN, OKLAHOMA, PROCLAIMING THE
MONTH OF FEBRUARY, 2023, AS BLACK HISTORY
MONTH IN THE CITY OF NORMAN.

- § 1. WHEREAS, since its origin in 1926 by the “Father of Black History”, Dr. Carter G. Woodson, in his pursuit to raise awareness of African Americans’ contributions to civilization, Black History Week began and evolved into Black History Month; and
- § 2. WHEREAS, 2023’s national theme, Black Resistance “A Journey to Equality” highlights institutions’ and affiliations’ efforts to lobby, litigate, legislate, protest, and has achieved success in areas of equality, and
- § 3. WHEREAS, we acknowledge the legacy of Black resistance movements throughout the United States and in Norman, including movements to rename DeBarr Hall and DeBarr Avenue, to integrate the University of Oklahoma in the famous *Sipuel vs. Board of Regents* U.S. Supreme Court legal case of 1948 which set legal precedent for the more famous 1954 *Brown vs. Topeka Board of Education* case, striking down the “separate by equal” legal doctrine and civil protests against police brutality and incidents of racial discrimination on the OU campus and the larger Norman community; and
- § 4. WHEREAS, in 2023, Norman, Oklahoma, and the United States will observe the 100th birthday celebration of the late Clara Luper, one of the first African-American graduates of the University of Oklahoma professional colleges, and who led famous sit-in movements and other acts of civil resistance; and
- § 5. WHEREAS, the Alliance of Black Employees, a City of Norman Employee Resource Group, established in 2021, also provides support and representation to the Black community in Norman, while providing non-Black communities an opportunity to learn the Black experience to better understand diverse perspectives; and
- § 6. WHEREAS, the Norman Human Rights Commission continues to work to dispel prejudice and discrimination, and to advance fairness, mutual understanding, and appreciation for the worth of all people.

NOW, THEREFORE, I, MAYOR OF THE CITY OF NORMAN, OKLAHOMA:

- § 7. Do hereby proclaim the month of February, 2023, as Black History Month in the City of Norman and invite all citizens to join me in celebrating the diversity and character of our community.

PASSED AND APPROVED this 14th day of February, 2023.

Mayor

ATTEST:

City Clerk



File Attachments for Item:

5. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-22 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE LOT ONE (1), BLOCK ONE (1), OF HISTORIC BERRY FARMS ADDITION, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE CO, SUBURBAN OFFICE COMMERCIAL DISTRICT, AND R-3, MULTI-FAMILY DWELLING DISTRICT, AND PLACE SAME IN THE SPUD, SIMPLE PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (1300 WEST LINDSEY STREET)



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/28/2023

REQUESTER: Sooner Traditions Realty, L.L.C.

PRESENTER: Jane Hudson, Director of Planning & Community Development

ITEM TITLE: CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-22 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE LOT ONE (1), BLOCK ONE (1), OF HISTORIC BERRY FARMS ADDITION, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE CO, SUBURBAN OFFICE COMMERCIAL DISTRICT, AND R-3, MULTI-FAMILY DWELLING DISTRICT, AND PLACE SAME IN THE SPUD, SIMPLE PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (1300 WEST LINDSEY STREET)

PROJECT OVERVIEW:

The applicant, Sooner Traditions Realty, L.L.C., is requesting a rezoning from CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, to SPUD, Simple Planned Unit Development, for approximately 2.19 acres at 1300 W. Lindsey St. The northern portion of the subject property was zoned CO, Suburban Office Commercial District, with Ordinance O-0102-48 and the southern portion was zoned R-3, Multi-Family Dwelling District, with Ordinance 1951.

PROCEDURAL REQUIREMENTS:

GREENBELT MEETING: GB22-19, December 20, 2022

This item was on the consent docket for the Greenbelt Commission. There were no comments to be forwarded to Planning Commission.

PRE-DEVELOPMENT MEETING: PD22-27, November 17, 2022

The neighbor was interested with alley access and was curious about alternative access to the site. The applicant stated that alternative access was considered. The neighbor also was concerned about the drive thru lane and how many cars it can accommodate at one time. The applicant stated that about 10-12 cars can fit in the drive thru lane at one time. A neighbor voiced his support for the development and thinks this will be a great addition for the community.

ZONING ORDINANCE CITATION:

SEC 420.05 – SIMPLE PLANNED UNIT DEVELOPMENTS

1. General Description. The Simple Planned Unit Development referred to as SPUD, is a special zoning district that provides an alternate approach to the conventional land use controls and to a PUD, Planned Unit Development to maximize the unique physical features of a particular site and produce unique, creative, progressive, or quality land developments.

The SPUD may be used for particular tracts or parcels of land that are to be developed, according to a SPUD Narrative and a Development Plan Map and contains less than five (5) acres.

The SPUD is subject to review procedures by Planning Commission and adoption by City Council.

2. Statement of Purpose. It is the intent of this section to encourage developments with a superior built environment brought about through unified development and to provide for the application of design ingenuity in such developments while protecting existing and future surrounding areas in achieving the goals of comprehensive plan of record. In addition, the SPUD provides for the following:

Encourage efficient, innovative use of land in the placement and/or clustering of buildings in a development and protect the health, safety and welfare of the community.

Contribute to the revitalization and/or redevelopment of areas where decline of any type has occurred.

Promote infill development that is compatible and harmonious with adjacent uses and would otherwise not be an area that could physically be redeveloped under conventional zoning.

Maintain consistency with the City's Zoning Ordinance, and other applicable plans, policies, standards and regulations on record.

Approval of a zone change to a SPUD adopts the Master Plan prepared by the applicant and reviewed as a part of the application. The SPUD establishes new and specific requirements for the amount and type of land use, residential densities, if appropriate, development regulations and location of specific elements of the development, such as open space and screening.

STAFF ANALYSIS: The particulars of this PUD include:

USE: This SPUD proposes certain commercial and office uses for the property. Short-term rental is also in the proposed uses. A complete list of proposed uses is included as Exhibit C in the SPUD Narrative.

OPEN SPACE: A large portion of Parcel B (as shown on the site plan) will be preserved as open space. There are no buildings proposed south of the existing office building. A total of 1.12 acres, or 51% of the site, is proposed as open space for the development.

PARKING: The SPUD Narrative states the parking will meet the City's parking ordinances. There are no minimum requirements for parking spaces at this time. The applicant is proposing parking as demonstrated on the Site Development Plan, which shows spaces along the west, north, and east property lines of Parcel A and interior spaces near the buildings.

PHASES: It is anticipated Parcel A will be developed first; however, this will depend on market demand and absorption rates.

SITE PLAN/ACCESS: There are two proposed access points for this development. There is one existing access point off W. Lindsey St. The applicant proposes to extend the existing alley that is on the eastern side of the property, which will become the second access point. The existing office building on Parcel B will remain. A new multi-tenant building with a drive-thru lane on the south side is proposed on Parcel A.

AREA REGULATIONS: The area regulations in the SPUD Narrative are as follows:

- Front Setback: All buildings shall be set back a minimum of twenty-five (25) feet from the northernmost property line of Parcel A and Parcel B.
- Side Setback: There shall be a minimum five (5) feet building setback on both Parcel A and Parcel B measured from the easternmost and westernmost property lines.
- Rear Setback: All buildings shall be set back a minimum of twenty (20) feet from the southernmost property line of Parcel A. All buildings shall be set back a minimum of thirty (30) feet from the southernmost property line Parcel B
- Height: No buildings shall exceed three and one-half (3-1/2) stories or forty-five (45) feet in height, excluding any necessary roof top mechanical units, equipment, screening, or parapet walls.

LANDSCAPING: The Site Development Plan shows which existing trees will remain. These trees will be trimmed to clear any sight issues at the drive. The SPUD Narrative says the development will meet or exceed the City's landscaping requirements.

SIGNAGE: The development will meet the commercial sign requirements in Chapter 18, Sign Regulations.

LIGHTING: The exterior lighting for the proposed development will meet the requirements of the City's Commercial Outdoor Lighting Standards. This will require full cut-off lighting.

EXISTING ZONING: The existing zoning for the subject property is CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District. The CO District allows for offices, assembly halls, art galleries, and other lower intensity uses, as well as short-term rentals. The R-3 District allows for single-family uses, two-family dwellings, and apartment houses.

ALTERNATIVES/ISSUES:

IMPACTS: The proposed SPUD would allow for more intense uses than the current zoning; however, the surrounding properties on W. Lindsey St. are commercial districts allowing for similar uses. The proposed site plan does not allow for access on Rebecca Ln., which has mostly residential uses. This development would not cause higher traffic in the neighborhood to the

south. The existing green space between the existing office building and Rebecca Ln. will be preserved.

OTHER AGENCY COMMENTS:

BOARD OF PARKS COMMISSIONERS: N/A for this item.

UTILITIES: Water service from the existing 24-inch line will require a tee and fire hydrant for connection of services and no direct service taps on the 24-inch line will be allowed. The proposed monument sign cannot be over the water main and no detention is allowed over the water main. For sewer service, no service taps allowed on the 21-inch sewer line along Lindsey Street but service into the manhole would be acceptable. Sewer extension from adjacent properties may be necessary for service to the rear structure. Dumpster location is acceptable for solid waste service. No recycling service since the location will be commercial.

PUBLIC WORKS/ENGINEERING: A drainage report has been submitted by the applicant. Detention is being provided for the development.

TRAFFIC ENGINEER: Because the existing access point off W. Lindsey St. is not changing, no traffic study is required for this development.

FIRE DEPARTMENT: No comments from the Fire Department.

CONCLUSION:

Staff forwards this request for rezoning from CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, to SPUD, Simple Planned Unit Development, and Ordinance O-2223-22 for consideration by City Council. At their January 12, 2023 meeting, Planning Commission unanimously recommended adoption of Ordinance O-2223-23, by a vote of 9-0.

1300 W. LINDSEY

SIMPLE PLANNED UNIT DEVELOPMENT

APPLICANT:

SOONER TRADITIONS REALTY, LLC

APPLICATION FOR:

SIMPLE PLANNED UNIT DEVELOPMENT
NORMAN 2025 AMENDMENT

NOVEMBER 28, 2022
REVISED DECEMBER 22, 2022

PREPARED BY:

RIEGER LAW GROUP PLLC
136 Thompson Drive
Norman, Oklahoma 73069

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I. INTRODUCTION

Background and Intent

II. PROPERTY DESCRIPTION/EXISTING PROPERTY CONDITIONS

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- C. Elevation and Topography
- D. Utility Services
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- F. Traffic Circulation and Access

III. DEVELOPMENT PLAN AND DESIGN CONCEPT

- A. Permitted Uses
- B. Development Criteria

EXHIBITS

- A. Legal Description
- B. Preliminary Site Development Plan
- C. Allowable Uses

I. INTRODUCTION

This Simple Planned Unit Development (the “**SPUD**”) is being submitted for the property located at 1300 W. Lindsey Street, as more particularly described on **Exhibit A** (the “**Property**”). This SPUD seeks to facilitate a development featuring commercial, retail, and office buildings on the Property, in accordance with the development regulations contained in this SPUD. The Applicant will subsequently seek a short form plat bifurcating the Property into the two parcels shown on the attached Preliminary Site Development Plan. This SPUD will allow for development that is compatible with the surrounding uses, while maintaining substantial green space to the rear of the Property.

II. PROPERTY DESCRIPTIONS; EXISTING CONDITIONS

A. Location

The Property is located at 1300 W. Lindsey Street.

B. Existing Land Use and Zoning

The existing zoning is CO, Suburban Office Commercial and R-3, Multi-Family Dwelling District. The existing NORMAN 2025 Land Use Plan designation is Commercial and High Density Residential. The Applicant seeks to rezone the Property, pursuant to this SPUD, and amend the Property’s NORMAN 2025 Land Use Plan designation to Commercial.

C. Elevation and Topography; Drainage

The Property is generally flat with little elevation change throughout. An existing office is located on the Property.

D. Utility Services

The necessary utility services for this project are already located on or near the Property.

E. Fire Protection Services

Fire protection services shall be provided in accordance with all applicable City of Norman regulations for such services.

F. Traffic Circulation and Access

Traffic circulation and access to the Property shall be allowed in the manner shown on the attached Preliminary Site Development Plan. As noted on the Preliminary Site Development Plan, no access will be permitted to Rebecca Lane.

III. DEVELOPMENT PLAN AND DESIGN CONCEPT

A. **Uses Permitted**

This SPUD will feature commercial, retail, and office uses. A complete list of allowable uses on the Property is attached as Exhibit C.

B. **Site Plan**

The Property shall be developed as depicted on the Preliminary Site Development Plan, attached hereto as Exhibit B, subject to final design development and the changes allowed by Section 22.420.05(11) of the City of Norman's SPUD Ordinance, as may be amended from time to time.

C. **Area Regulations**

Front Setback: All buildings shall be set back a minimum of twenty-five (25) feet from the northernmost property line of Parcel A and Parcel B.

Side Setback: There shall be a minimum five (5) feet building setback on both Parcel A and Parcel B measured from the easternmost and westernmost property lines.

Rear Setback: All buildings shall be set back a minimum of twenty (20) feet from the southernmost property line of Parcel A. All buildings shall be set back a minimum of thirty (30) feet from the southernmost property line Parcel B

Height: No buildings shall exceed three and one-half (3-1/2) stories or forty-five (45) feet in height, excluding any necessary roof top mechanical units, equipment, screening, or parapet walls.

D. **Traffic access/circulation/sidewalks**

Traffic circulation and access to the Property shall be allowed in the manner shown on the attached Preliminary Site Development Plan. All sidewalks shall be in accordance with the final development plans and the City of Norman's applicable standards and specifications.

E. **Signage**

All signage shall comply with the applicable requirements contained in the City of Norman Sign Code, Chapter 18, for the commercial uses, as amended from time to time.

F. **Lighting**

All new exterior lighting shall comply with the applicable provisions of the City of Norman's Commercial Outdoor Lighting Standards, as may be amended from time to time.

G. Parking

Parking for the Property shall be developed in general compliance with the parking layout shown on the Preliminary Site Development Plan. The Property shall comply with Norman's applicable parking ordinances, as amended from time to time.

H. Landscaping

The Property's landscaping shall be installed and maintained in order to meet or exceed the City of Norman's applicable landscaping requirements, as amended from time to time.

I. Open Space

Open space and green space areas are located throughout the Property, as shown on the Open Space Exhibit attached hereto as Exhibit D. A minimum of 10% of the Property shall be designated as Open Space.

J. Phasing

It is anticipated that the development of the Property will occur in multiple phases. It is expected that the initial phase of development will be Parcel A; however, the actual timing, sequence, and number of future phases will be determined by market demand and absorption rates.

K. Sanitation

Trash dumpster will be located as depicted on the Preliminary Site Development Plan or in locations as modified or approved by City sanitation services.

L. Exterior Materials

The exterior of the buildings may be constructed of brick, stone, synthetic stone, high impact quality stucco or EIFS, masonry, metal accents, and any combination thereof.

M. Drainage

A preliminary drainage report has been provided to City Staff. The development of the Property shall meet or exceed the applicable ordinances and standards of the City.

EXHIBIT A

Legal Description of the Property

Lot One (1), in Block One (1), of Historic Berry Farms Addition, to Norman, Cleveland County, Oklahoma, according to the recorded plat thereof.

EXHIBIT B
Preliminary Site Development Plan
[Attached]

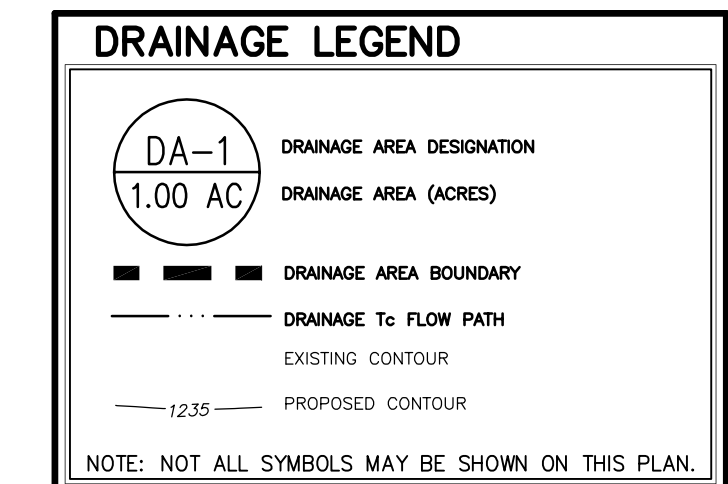
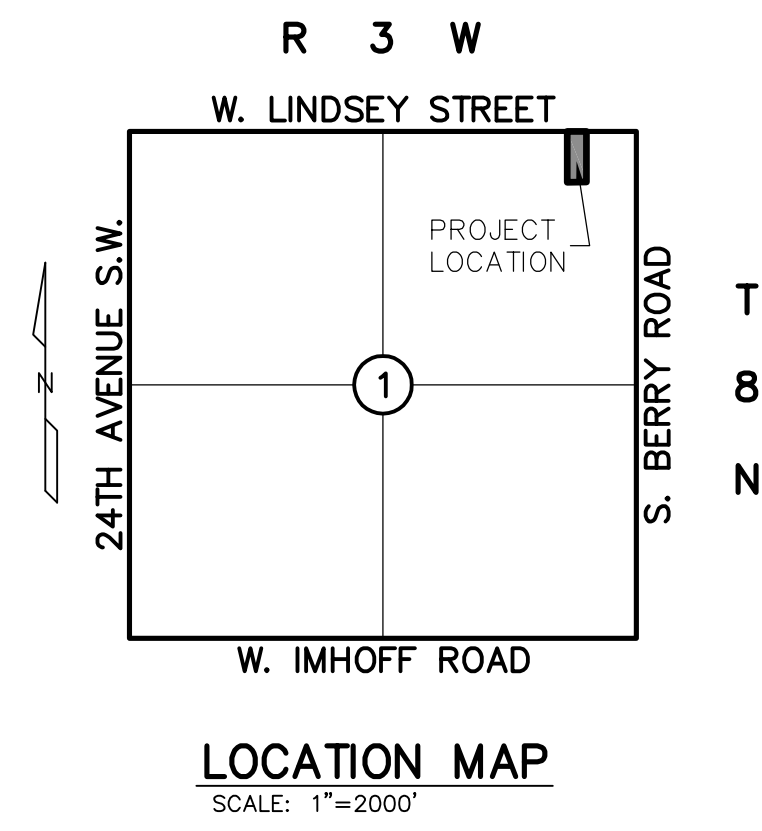
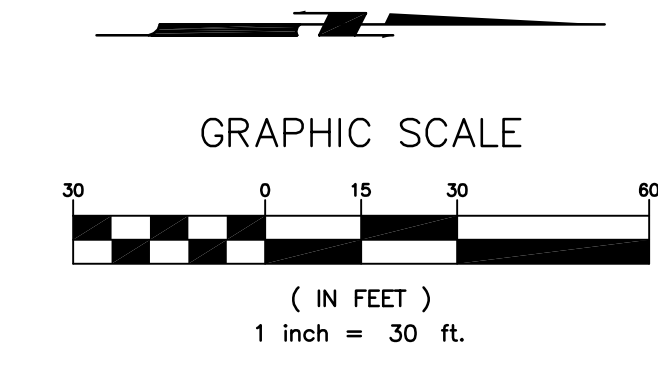
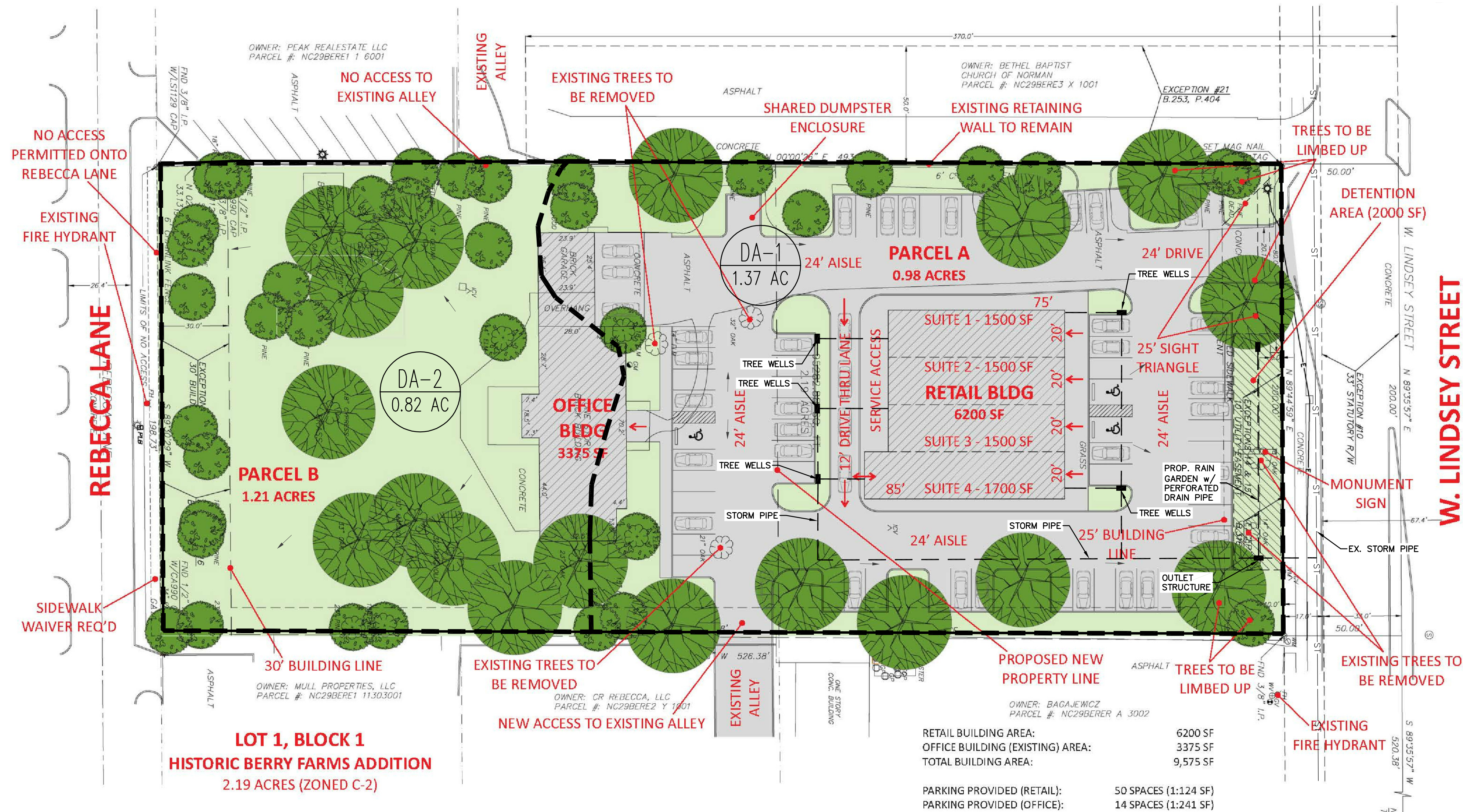


EXHIBIT C
Allowable Uses

- Art Gallery/Studio.
- Assembly Halls of non-profit corporations.
- Libraries.
- Museums.
- Music Conservatories.
- Office buildings and office uses.
- Trade schools and schools for vocational training.
- Churches.
- Short-term rentals.
- Antique shop.
- Appliance Store.
- Artist materials supply, or studio.
- Automobile parking lots.
- Automobile supply store.
- Baby shop.
- Bakery/Baked Goods store.
- Bank.
- Barber shop, or beauty parlor.
- Book or stationery store.
- Camera shop.
- Candy store.
- Catering establishment.
- Child Care / Day Care establishment.
- Clothing or apparel store.
- Coffee house or coffee shop.
- Dairy products or ice cream store.
- Delicatessen store.
- Dress shop.
- Drug store or fountain.
- Dry Cleaning and Laundry Establishment.
- Dry goods store.
- Fabric or notion store.
- Florist/Flower Shop.
- Furniture Store.
- Gift Shop.
- Grocery or supermarket.
- Hardware store.
- Hotel or motel.

- Interior decorating store.
- Jewelry shop.
- Key shop.
- Leather Store and/or Leather Goods Store.
- Locksmith.
- Medical Marijuana Dispensary, as allowed by state law.
- Music, Radio, Electronics, Telephone, or Television Store.
- Painting and decorating shop.
- Pet shop/or Small Animal Hospital.
- Pharmacy.
- Photographer's studio.
- Restaurant/Bar/Lounge/Tavern
 - may include live entertainment and/or a dance floor, (all such activity fully within an enclosed building) provided the kitchen remains open with full food service whenever live entertainment is offered.
- Retail Shops or Stores.
- Retail spirits store/Liquor store.
- Spa or Similar Establishment.
- Smoke, Tobacco, Vape, or Similar Shop.
- Self-service laundry.
- Sewing machine sales.
- Sporting goods sales.
- Shoe store or repair shop.
- Sign Store/Printing Store.
- T-Shirt Printing or Similar Sales or Services.
- Tanning Spa or Tanning Establishment.
- Tailor shop.
- Theater (excluding drive-in theaters), Bowling Alley, and Arcade, including those that sell alcoholic beverages in compliance with state law.
- Tier I Medical Marijuana Processor, as allowed by state law.
- Tier II Medical Marijuana Processor, as allowed by state law.
- Toy store.

EXHIBIT D
Preliminary Open Space Plan
[Attached]



PICKARD ACRES COMMERCIAL

HISTORIC:
IMPERVIOUS AREA: 16417 sf = 17%
95283 sf
IMPERVIOUS "C"= 0.95
PERVIOUS "C"= 0.30
CALCULATED "C"= 0.17(0.95) + 0.83(0.30)= 0.411

PROPOSED:
IMPERVIOUS AREA: 46319 sf = 49%
TOTAL AREA: 95283 sf
IMPERVIOUS "C"= 0.95
PERVIOUS "C"= 0.30
CALCULATED "C"= 0.49(0.95) + 0.51(0.30)= 0.619

OWNER/DEVELOPER:
SOONER TRADITIONS, LLC
P.O. BOX 5156
NORMAN, OK 73070

ENGINEER:
ARC ENGINEERING
CONSULTANTS, LLC
STEVE ROLLINS, P.E.
135 DEER CREEK ROAD
EDMOND, OK 73012

Arc Engineering Consultants, LLC
CIVIL ENGINEERING
LAND PLANNING
135 DEER CREEK ROAD
EDMOND, OK 73012
PHONE (405) 509-0212
FAX (405) 509-0212
CERTIFICATE OF AUTHORIZATION NO. 6290 EXP. 6/30/24

PRELIMINARY
THIS DOCUMENT IS PRELIMINARY
IN NATURE AND IS NOT A FINAL
SIGNED AND SEALED DOCUMENT

1300 W. LINDSEY
1300 W. LINDSEY STREET
NORMAN, CLEVELAND COUNTY, OKLAHOMA
PRELIMINARY DRAINAGE AREA MAP

REVISIONS	NO.	DESCRIPTION	DATE
DRAWN BY:	SDR		
CHECKED BY:	SDR		
APPROVED BY:	SDR		

PROJECT NUMBER:	22-014
DATE:	12-27-22
SCALE:	1"=20'
(HORIZ.)	N/A
(VERT.)	N/A

SHEET NUMBER
1 of 1

O-2223-22

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE LOT ONE (1), BLOCK ONE (1), OF HISTORIC BERRY FARMS ADDITION, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE CO, SUBURBAN OFFICE COMMERCIAL DISTRICT, AND R-3, MULTI-FAMILY DWELLING DISTRICT, AND PLACE SAME IN THE SPUD, SIMPLE PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (1300 WEST LINDSEY STREET)

- § 1. WHEREAS, Sooner Traditions Realty, L.L.C., the owners of the hereinafter described property, have made application to have the subject property removed from the CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, and placed in the SPUD, Simple Planned Unit Development District; and
- § 2. WHEREAS, said application has been referred to the Planning Commission of said City and said body has, after conducting a public hearing as required by law, considered the same and recommended that the same should be granted and an ordinance adopted to effect and accomplish such rezoning; and
- § 3. WHEREAS, the City Council of the City of Norman, Oklahoma, has thereafter considered said application and has determined that said application should be granted and an ordinance adopted to effect and accomplish such rezoning.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 4. That Section 460 of Chapter 22 of the Code of the City of Norman, Oklahoma, is hereby amended so as to remove the following described property from the CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, and place the same in the SPUD, Simple Planned Unit Development District, to wit:

Lot One (1), in Block One (1), of Historic Berry Farms Addition, to Norman, Cleveland County, Oklahoma, according to the recorded plat thereof.

Ordinance O-2223-22

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- § 5. Further, pursuant to the provisions of Section 22:420.05 of the Code of the City of Norman, as amended, the following condition is hereby attached to the zoning of the tract:
- a. The site shall be developed in accordance with the SPUD Narrative, Site Development Plan, and supporting documentation approved by the Planning Commission on January 12, 2023, and made a part hereof.
- § 6. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance.

ADOPTED this _____ day of _____, 2023.

NOT ADOPTED this _____ day of _____, 2023.

(Mayor)

(Mayor)

ATTEST:

(City Clerk)

ORDINANCE NO. O-2223-22

ITEM NO. 4

STAFF REPORT**GENERAL INFORMATION**

APPLICANT	Sooner Traditions Realty, L.L.C.
REQUESTED ACTION	Rezoning to SPUD, Simple Planned Unit Development
EXISTING ZONING	CO, Suburban Office Commercial District and R-3, Multi-Family Dwelling District
SURROUNDING ZONING	North: C-2, General Commercial District East: C-1, Local Commercial District, and C-2, General Commercial District South: R-3, Multi-Family Dwelling District, and R-2, Two Family Dwelling District West: C-2, General Commercial District
LOCATION	1300 W. Lindsey Street
WARD	Ward 2
CORE AREA	No
AREA/SF	2.19 acres, more or less
PURPOSE	Commercial and Office development
EXISTING LAND USE	Office
SURROUNDING LAND USE	North: Commercial East: Commercial and multi-family residential South: Two-family residential West: Church and multi-family residential
LAND USE PLAN DESIGNATION	Commercial and High Density Residential
PROPOSE LAND USE DESIGNATION	Commercial

PROJECT OVERVIEW: The applicant, Sooner Traditions Realty, L.L.C., is requesting a rezoning from CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, to SPUD, Simple Planned Unit Development, for approximately 2.19 acres at 1300 W. Lindsey St. The northern portion of the subject property was zoned CO, Suburban Office Commercial District, with Ordinance No. O-0102-48 and the southern portion was zoned R-3, Multi-Family Dwelling District, with Ordinance No. O-1951.

PROCEDURAL REQUIREMENTS:

GREENBELT MEETING: GB22-19, December 20, 2022

This item was on the consent docket for the Greenbelt Commission. No comments were made to be forwarded to Planning Commission.

PRE-DEVELOPMENT MEETING: PD22-27, November 17, 2022

The neighbor was interested with alley access and was curious about alternative access to the site. The applicant stated that alternative access was considered. The neighbor also was concerned about the drive thru lane and how many cars it can accommodate at one time. The applicant stated that about 10-12 cars can fit in the drive thru lane at one time. A neighbor voiced his support for the development and thinks this will be a great addition for the community.

ZONING ORDINANCE CITATION:

SEC 420.05 – SIMPLE PLANNED UNIT DEVELOPMENTS

1. General Description. The Simple Planned Unit Development referred to as SPUD, is a special zoning district that provides an alternate approach to the conventional land use controls and to a PUD, Planned Unit Development to maximize the unique physical features of a particular site and produce unique, creative, progressive, or quality land developments.

The SPUD may be used for particular tracts or parcels of land that are to be developed, according to a SPUD Narrative and a Development Plan Map and contains less than five (5) acres.

The SPUD is subject to review procedures by Planning Commission and adoption by City Council.

2. Statement of Purpose. It is the intent of this section to encourage developments with a superior built environment brought about through unified development and to provide for the application of design ingenuity in such developments while protecting existing and future surrounding areas in achieving the goals of comprehensive plan of record. In addition the SPUD provides for the following:

Encourage efficient, innovative use of land in the placement and/or clustering of buildings in a development and protect the health, safety and welfare of the community.

Contribute to the revitalization and/or redevelopment of areas where decline of any type has occurred. Promote infill development that is compatible and harmonious with adjacent uses and would otherwise not be an area that could physically be redeveloped under conventional zoning.

Maintain consistency with the City's Zoning Ordinance, and other applicable plans, policies, standards and regulations on record.

Approval of a zone change to a SPUD adopts the Master Plan prepared by the applicant and reviewed as a part of the application. The SPUD establishes new and specific requirements for the amount and type of land use, residential densities, if appropriate, development regulations and location of specific elements of the development, such as open space and screening.

STAFF ANALYSIS: The particulars of this PUD include:

USE: This SPUD proposes certain commercial and office uses for the property. Short-term rental is also in the proposed uses. A complete list of proposed uses is included as Exhibit C in the SPUD Narrative.

OPEN SPACE: A large portion of Parcel B (as shown on the site plan) will be preserved as open space. There are no buildings proposed south of the existing office building. A total of 1.12 acres, or 51% of the site, is proposed as open space for the development.

PARKING: The SPUD Narrative states the parking will meet the City's parking ordinances. There are no minimum requirements for parking spaces at this time. The applicant is proposing parking as demonstrated on the Site Development Plan, which shows spaces along the west, north, and east property lines of Parcel A and interior spaces near the buildings.

PHASES: It is anticipated Parcel A will be developed first; however, this will depend on market demand and absorption rates.

SITE PLAN/ACCESS: There are two proposed access points for this development. There is one existing access point off W. Lindsey St. The applicant proposes to extend the existing alley that is on the eastern side of the property, which will become the second access point. The existing office building on Parcel B will remain. A new multi-tenant building with a drive-thru lane on the south side is proposed on Parcel A.

AREA REGULATIONS: The area regulations in the SPUD Narrative are as follows:

- Front Setback: All buildings shall be set back a minimum of twenty-five (25) feet from the northernmost property line of Parcel A and Parcel B.
- Side Setback: There shall be a minimum five (5) feet building setback on both Parcel A and Parcel B measured from the easternmost and westernmost property lines.
- Rear Setback: All buildings shall be set back a minimum of twenty (20) feet from the southernmost property line of Parcel A. All buildings shall be set back a minimum of thirty (30) feet from the southernmost property line Parcel B
- Height: No buildings shall exceed three and one-half (3-1/2) stories or forty-five (45) feet in height, excluding any necessary roof top mechanical units, equipment, screening, or parapet walls.

LANDSCAPING: The Site Development Plan shows which existing trees will remain. These trees will be limbed up. The SPUD Narrative says the development will meet or exceed the City's landscaping requirements.

SIGNAGE: The development will meet the commercial sign requirements in Chapter 18, Sign Regulations.

LIGHTING: The exterior lighting for the proposed development will meet the requirements of the City's Commercial Outdoor Lighting Standards. This will require full cut-off lighting.

EXISTING ZONING: The existing zoning for the subject property is CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District. The CO District allows for offices, assembly halls, art galleries, and other lower intensity uses, as well as short-term rentals. The R-3 District allows for single-family uses, two-family dwellings, and apartment houses.

ALTERNATIVES/ISSUES:

IMPACTS: The proposed SPUD would allow for more intense uses than the current zoning; however, the surrounding properties on W. Lindsey St. are commercial districts allowing for similar uses. The proposed site plan does not allow for access on Rebecca Ln., which has mostly residential uses. This development would not cause higher traffic in the neighborhood to the south. The existing green space between the existing office building and Rebecca Ln. will be preserved.

OTHER AGENCY COMMENTS:

BOARD OF PARKS COMMISSIONERS: N/A for this item.

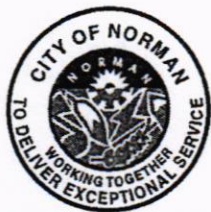
UTILITIES: Water service from the existing 24-inch line will require a tee and fire hydrant for connection of services and no direct service taps on the 24-inch line will be allowed. The proposed monument sign cannot be over the water main and no detention is allowed over the water main. For sewer service, no service taps allowed on the 21-inch sewer line along Lindsey Street but service into the manhole would be acceptable. Sewer extension from adjacent properties may be necessary for service to the rear structure. Dumpster location is acceptable for solid waste service. No recycling service since the location will be commercial.

PUBLIC WORKS/ENGINEERING: A drainage report has been submitted by the applicant. Detention is being provided for the development.

TRAFFIC ENGINEER: Because the existing access point off W. Lindsey St. is not changing, no traffic study is required for this development.

FIRE DEPARTMENT: No comments from the Fire Department.

CONCLUSION: Staff forwards this request for rezoning from CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, to SPUD, Simple Planned Unit Development, and Ordinance No. O-2223-22 to the Planning Commission for consideration and recommendation to City Council.



CITY OF NORMAN, OK PLANNING COMMISSION MEETING

Municipal Building, Council Chambers, 201 West Gray, Norman, OK 73069
Thursday, January 12, 2023 at 6:30 PM

MINUTES

The Planning Commission of the City of Norman, Cleveland County, State of Oklahoma, met in Regular Session in Council Chambers of the Norman Municipal Building, 201 West Gray Street, on the 12th day of January, 2023.

Notice and agenda of the meeting were posted at the Norman Municipal Building and online at <https://norman-ok.municodemeetings.com> at least twenty-four hours prior to the beginning of the meeting.

Chair Erica Bird called the meeting to order at 6:30 p.m.

ROLL CALL

PRESENT

Cameron Brewer
Kevan Parker
Liz McKown
Steven McDaniel
Erica Bird
Douglas McClure
Jim Griffith
Maria Kindel
Michael Jablonski

A quorum was present.

STAFF MEMBERS PRESENT

Jane Hudson, Director, Planning & Community Development
Lora Hoggatt, Planning Services Manager
Colton Wayman, Planner I
Beth Muckala, Assistant City Attorney
Todd McLellan, Development Engineer
Roné Tromble, Recording Secretary
Mitchell Richardson, Multimedia Supervisor

1. Election of Officers

Motion made by Steven McDaniel to nominate Erica Bird as Chair, Kevan Parker as Vice Chair, and Michael Jablonski as Secretary; seconded by Liz McKown.

Voting Yea: Brewer, Parker, McKown, McDaniel, Bird, McClure, Griffith, Kindel, Jablonski

4. Consideration of Approval, Acceptance, Rejection, Amendment, and/or Postponement of Resolution No. R-2223-76: Sooner Traditions Realty, L.L.C. requests amendment of the NORMAN 2025 Land Use & Transportation Plan from Commercial Designation and High Density Residential Designation to Commercial Designation for approximately 2.19 acres of property located at 1300 W. Lindsey Street.

ITEMS SUBMITTED FOR THE RECORD:

1. NORMAN 2025 Map
2. Staff Report

and

5. Consideration of Approval, Acceptance, Rejection, Amendment, and/or Postponement of Ordinance No. O-2223-22: Sooner Traditions Realty, L.L.C. requests rezoning from CO, Suburban Office Commercial District, and R-3, Multi-Family Dwelling District, to SPUD, Simple Planned Unit Development, for approximately 2.19 acres of property located at 1300 W. Lindsey Street.

ITEMS SUBMITTED FOR THE RECORD:

1. Location Map
2. Staff Report
3. 1300 W. Lindsey SPUD Narrative with Exhibits A-D

PRESENTATION BY STAFF: Mr. Wayman reviewed the staff report, a copy of which is filed with the minutes.

PRESENTATION BY THE APPLICANT: Sean Rieger, Rieger Law Group, representing the applicant, presented the project.

Mr. Griffith asked if the existing law office will be retained as a law office. Mr. Rieger responded that the structure will be retained, but the uses could change.

Mr. Griffith asked about the large green space and maintenance of it. Mr. Rieger responded.

Mr. Parker commented there may be a water line that runs through the area designated for storm water detention. Mr. Rieger responded.

Ms. McKown commended the applicant on keeping the mature trees and open space. Mr. Jablonski agreed.

Mr. Jablonski asked about how far a nearby cell tower is from the buildings. Mr. Rieger responded that he did not know, but he believes the ordinance discusses a 200' separation for residential uses.

Ms. Bird asked if the median on Lindsey is blocking the ability to make a left turn into the property. Mr. Rieger responded that Lindsey Street allows U-turns.

AUDIENCE PARTICIPATION:

Adam Ross, 3308 Winchester Circle, made comments regarding rezoning of R-3, pedestrian connectivity to Rebecca Lane, and a large mature tree.

Braelyn Polite, 240 E. Kerr, Midwest City, made comments.

DISCUSSION AND ACTION BY THE PLANNING COMMISSION:

Mr. Jablonski asked what would happen if there is a water line in the front of the property. Mr. Rieger responded.

Mr. Parker commented on rain gardens. Mr. Rieger responded.

Mr. Griffith asked if there is any way the mature tree near the rain gardens can be saved. Mr. Rieger said they will look at it.

Mr. Brewer commented he thinks this plan is in the spirit of the 2025 plan. This was a prime opportunity to have more creativity with the development, specifically with the orientation of the building on the site to address the sea of parking along Lindsey Street.

Mr. Jablonski asked if there is a way to stimulate the kind of development that the Commission thinks would be more productive in terms of beautifying the area.

Motion made by Kevan Parker to recommend approval of Resolution No. R-2223-76 and Ordinance No. O-2223-22 to City Council; seconded by Steven McDaniel.

Voting Yea: Brewer, Parker, McKown, McDaniel, Bird, McClure, Griffith, Kindel, Jablonski

The motion to recommend approval of Resolution R-2223-76 and Ordinance O-2223-22 to City Council passed by a vote of 9-0.

File Attachments for Item:

6. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-24 UPON FIRST READING BY TITLE:
AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING ARTICLE I OF CHAPTER 16 (PUBLIC IMPROVEMENTS) OF THE CODE OF THE CITY OF NORMAN BY ADOPTING AND INCORPORATING BY REFERENCE THEREIN THE CITY OF NORMAN STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS AND THE ENGINEERING DESIGN CRITERIA FOR STREETS, STORMWATER, WATER LINES, AND SANITARY SEWERS DATED FEBRUARY 28, 2023, PROVIDING ENFORCEMENT REMEDIES INCLUDING PENALTIES FOR VIOLATION; AND PROVIDING FOR THE SEVERABILITY THEREOF.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 2/14/2023

REQUESTER: Scott Sturtz, City Engineer

PRESENTER: Shawn O'Leary, Director of Public Works

TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-24 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING ARTICLE I OF CHAPTER 16 (PUBLIC IMPROVEMENTS) OF THE CODE OF THE CITY OF NORMAN BY ADOPTING AND INCORPORATING BY REFERENCE THEREIN THE CITY OF NORMAN STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS AND THE ENGINEERING DESIGN CRITERIA FOR STREETS, STORMWATER, WATER LINES, AND SANITARY SEWERS DATED FEBRUARY 28, 2023, PROVIDING ENFORCEMENT REMEDIES INCLUDING PENALTIES FOR VIOLATION; AND PROVIDING FOR THE SEVERABILITY THEREOF.

BACKGROUND:

The Engineering Design Criteria (EDC) and Standard Specifications and Construction Drawings (Specifications) were adopted by the City Council on September 24, 1996, and the last of nine amendments was adopted on July 11, 2006. The EDC provides developers and consultants with a standardized design for all public improvements including roadways, stormwater systems, erosion control, street lights, traffic signals, sidewalks, waterlines and sanitary sewer lines. These documents do not provide guidance on where or what type of development can occur. The need for new public infrastructure is typically established through the Comprehensive Land Use Plan, Zoning Codes and Subdivision Regulations. However, once the location and type of development is selected, the EDC provides the technical guidance on the design of the public improvements to meet City standards. The Standard Specifications provide the framework for the contractor's obligations in constructing public infrastructure to ensure that all projects are completed in a consistent manner. The Construction Drawings provide the contractor standard details to be used in the field for the construction of the improvements. By having standardized construction on public infrastructure the City can more easily inspect, accept and maintain the infrastructure.

In recent years, several studies and discussions have highlighted the need to update the EDC and Specifications. In 2014 the Comprehensive Transportation Plan (CTP) recommended that the EDC and Standards be updated to reflect the recommendations of the Norman CTP.

The City Council identified incentivizing optional “green building codes” as a secondary destination short-term goal (1-2 years) during the August 2017 Council Retreat. Since that time, the Council Community Planning and Transportation Committee (CPTC) has engaged in discussions regarding incentive programs for incentivizing green building practices and green infrastructure/low impact development (GI/LID) in the City of Norman. During this time, staff, private developers and experts in the field have also presented the CPTC with information and discussed potential options and ideas related to incentives for GI/LID and reduction to City parking requirements.

In addition, it was identified that the EDC and standards required updating to incorporate new technologies and ordinances to provide better guidance to developers, consultants and contractors.

In response to these needs, City Council appropriated funding in the Fiscal Years Ending (FYE) 2020 and 2021 Capital Improvement Program for an update of the EDC and Specifications. Staff identified the opportunity to combine the GI/LID program and EDC and Specifications update into one project to save effort and duplication.

The purpose of this project was to conduct a comprehensive review of the Engineering Design Criteria and Specifications, City ordinances, standards, and guidance documents. To identify potential barriers to implementation of GI/LID; and recommend potential changes to incentivize GI/LID; including but not limited to variances to parking and landscaping requirements. This has been incorporated in the review and update of the EDC and Specifications as outlined below to complete one document.

Public Works prepared a Request for Qualifications (RFQ) to solicit the services of a qualified firm to update the City of Norman EDC and Specifications. Three (3) statements of qualifications were received for this project. The Selection Committee included three (3) staff members consisting of Chris Mattingly, Capital Projects Engineer, Utilities Department ; Carrie Evenson, Stormwater Program Manager, Public Works Department; Scott Sturtz, City Engineer, Public Works Department; and two (2) private citizens including Andy Sherrer, Republic Bank; and Dr. Robert Nairn, School of Civil Engineering and Environmental Science, University of Oklahoma. The Selection Committee members independently scored each statement of qualifications on a point scale as defined in the RFQ. Based on these scores, two (2) firms were selected to be interviewed by the Selection Committee. The two (2) firms were ranked based on their interviews, and Freese and Nichols, Inc. (FNI), was selected for this project based upon their experience working with other municipalities on similar projects and the proposed methods and procedures for completing the project.

Required services included the following:

- Review of the current EDC and Standards.
- Comparison of City of Norman requirements to peer communities with recommendations for changes to meet the current industry standards.
- Incorporation of recommended revisions and corrections listed in the Meshek and Associates review report on the stormwater sections of the EDC.
- Review of City ordinances and guidance documents, such as the Center City Form Based Code, Wichita/Sedgwick County LID Manual, Norman 2025 Plan, parking requirements, landscaping/irrigation requirements, and others as applicable.

- Incorporation of new ordinances and code to include Water Quality Protection Zone (WQPZ), Lake Thunderbird Total Maximum Daily Load (TMDL), Americans with Disability Acts Public Right-of-Way Accessibility Guidelines (PROWAG), Center City Form-Based Code, and Tree Ordinance.
- Identification of potential barriers and areas of incentive for GI/LID.
- Review of parking requirements and provide recommendations for changes to reduce the amount required and incentivize GI/LID design.
- Review of irrigation requirements in the landscaping ordinance and provide recommendations for changes to incentivize GI/LID and water conservation.
- Stakeholder and public input meetings.
- Development of LID design, operations and maintenance manual(s).

On February 25, 2020, City Council approved Contract No. K-1920-114 by and between the City of Norman and FNI in the amount of \$125,000.00 for Phase I. Due to the funding being identified over two fiscal years, the project was split into phases. Phase I consisted of a diagnostic analysis and report of the City's existing EDC, Specifications, Standards, applicable City ordinances, and policy documents. This phase resulted in the definition of problems and issues arising from the City's current documents as defined by staff. The issues were compared against the backdrop of comments and interviews of a technical Advisory Committee, select City staff and stakeholders. Phase I also included a community benchmarking report to assist in establishing best management practices by reviewing these practices in comparable and aspirational communities to the City's current practices. The diagnostic report focused on updates to the current documents and procedures and identified barriers to adopting requirements for Green Stormwater Infrastructure Criteria.

On March 9, 2021, City Council approved Amendment Number 1 to contract K-1920-114 with Freese and Nichols for Phase II for the preparation of the updated EDC and Specifications, including a Green Stormwater Infrastructure (GSI) Criteria section and updated construction drawings to reflect new and updated design criteria in the amount of \$175,000.

DISCUSSION:

The EDC and Specifications have been updated based on the criteria listed above to provide the City with a current modernized document to better serve the community. All of the criteria set forth have been met by the project team and public input has been gathered and considered. This project has successfully accomplished the primary objectives, which were:

- Comprehensive update of the 25-year-old EDC, Standard Specifications and Construction Drawings
- Consolidation of multiple, disconnected manuals into one easily-accessible, modern manual
- Addition of Norman Green Stormwater Infrastructure (GSI) manual to EDC
- Incorporation of Complete Streets Policy in EDC
- Update Traffic Impact Analysis (TIA) guidelines
- Incorporation of PROWAG in EDC
- Incorporation of WQPZ policy and practices in EDC
- Correlation of EDC with CTP

This EDC has included the addition of Section 7000, which is a Sustainable Stormwater Development manual. The City of Norman adopted the City of Wichita and Sedgewick County, Kansas Stormwater Manual as a part of the Water Quality Protection Zone (WQPZ) by Ordinance O-1011-52 on June 28, 2011. This manual provides design guidelines for engineered solutions that are low impact development strategies. This document has become outdated and a new one was necessary. The EDC, if adopted, will replace the outdated manual. The inclusion of this manual in the EDC also provides guidance for all sustainable stormwater development. Future discussion with City Council will include options that the project team developed for incentivizing sustainable stormwater development to encourage the implementation of future development and designs.

The EDC and Specifications impact developers, consultants, contractors and the citizens of Norman. Because of these impacts, public participation played a significant role in the process. In Phase I a stakeholder committee was formed consisting of 25 members representing developers, home builders, consultants, community members and contractors. In Phase II the stakeholder committee was expanded to 33 members to get better representation from the community. During the development of the EDC the stakeholders were divided into subcommittees to focus on each of the technical areas. Some members served on multiple subcommittees. In addition to the stakeholder committee, public outreach was performed. Following is a timeline of the public engagement for the EDC and Specification update.

- June 2020 - The stakeholder committee met to discuss the preliminary diagnostic report process and the committee involvement.
- September - December 2020 - The stakeholders reviewed the diagnostic report and provided feedback.
- May 6, 2021 - The initial stakeholder meeting for Phase II was held.
- June - November, 2022 - The subcommittees met nine times to receive information from FNI on the proposed changes and provide feedback.
- September 29, 2022 - A draft of the EDC was provided to the stakeholders for review and comment.
- October 6, 2022 - A stakeholder meeting was held to discuss the EDC and the details of the project website where comments could be left for response from the project team.
- November 28, 2022 – Comments were provided to Mayor Heikkila from one specific local developer with a list of comments from developers and consultants.
- November 29, 2022 - Community participation began with the Council Study Session when the project website was announced and opened for public input. At this meeting, Council requested a longer response period for public input. The timeline for response was extended from December 15 to December 30 to meet this request.
- December 7, 2022 – A public meeting was held during the day in a virtual format.
- December 7, 2022 - An in person public meeting was held in the evening for public education and response.
- December 30, 2022 – The website was closed to comments from stakeholders and public to begin response and inclusion of comments.

A log was kept of all comments made on the website. Each comment received a response on the website. For ease of review a table of comments and responses has been provided with this item. A total of 31 comments were received with several being duplicate comments. The stakeholder committee accounted for 18 of the comments and the additional 13 comments were

from the public. In addition, the comments received by Mayor Heikkila from one specific local developer on November 28, 2022, were logged and each comment was responded to by the project team. A table with each comment and response is attached to this item.

The EDC and Specifications are long-term documents with an expected life of 20 or more years. However, the document is not static and periodic changes are required as the community changes and new technologies and materials are developed. To keep up with these changes the EDC and Specifications will be reviewed by staff every two years to determine if there is a need for amendment. If it is determined that changes are required, stakeholders will be contacted to provide input and the amendment will require City Council to adopt.

Now that public feedback has been received and responded to on the Engineering Design Criteria, Specifications and Construction Drawings, Council's review and approval is required to move forward with implementation. If Council approves the documents, the adopted documents will become effective in 30 days or on March 28, 2023. Staff will move forward with the next steps, which include notifying the development, design and construction industries as well as the citizens of Norman. This will include public notices, notices to relevant associations and information on the City of Norman website. The current documents will be replaced with the new documents to be effective on March 28, 2023.

Future Council Actions may be required to amend existing ordinances to be consistent with the EDC and Specifications. As an example, the WQPZ ordinance will need to be amended to remove reference to the Wichita/Sedgewick County Stormwater Manual.

RECOMMENDATION:

Staff recommends approval of Ordinance O-2223-24 adopting the Engineering Design Criteria, Standard Specification and Construction Drawings becoming effective on March 28, 2023.

Ordinance No. O-2223-24

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING ARTICLE I of CHAPTER 16 (PUBLIC IMPROVEMENTS) OF THE CODE OF THE CITY OF NORMAN BY ADOPTING AND INCORPORATING BY REFERENCE THEREIN THE CITY OF NORMAN STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS AND THE ENGINEERING DESIGN CRITERIA FOR STREETS, STORMWATER, WATER LINES, AND SANITARY SEWERS DATED FEBRUARY 28, 2023; PROVIDING ENFORCEMENT REMEDIES INCLUDING PENALTIES FOR VIOLATION; AND PROVIDING FOR THE SEVERABILITY THEREOF.

§ 1. WHEREAS the City of Norman is in the process of Municipal Code recodification, which recodification, if approved, would provide for the repeal of certain provisions and for the manner of amendment to the remaining code provisions.

§ 2. WHEREAS the portions of the Norman Municipal Code addressed in this Ordinance would be, upon such recodification, renumbered and modified as set forth in therein.

§ 3. WHEREAS, amendments to the current code which predate the effective date of said recodification shall, upon approval, be fully implemented therein.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

§ 4. That Article I (Public Improvements In General) of Chapter 16 (Public Improvements), which will ultimately be recodified as Article 26-I of Chapter 26, of the Code of the City of Norman shall be amended to read as follows:

26-101 Engineering Design Criteria And Standard Specifications And Construction Drawings For Streets, Stormwater, Water Lines, And Sanitary Sewers; Adoption and Amendment.

(a) The City of Norman Engineering Design Criteria and Standard Specifications and Construction Drawings for Streets, Storm Drainage, Water Lines, and Sanitary Sewers as adopted by City Council in Ordinance No. O-9697-13, and as was amended from time to time thereafter, shall be fully replaced with the City Engineering Design Criteria and Standard Specifications and Construction Drawings for Streets, Stormwater, Water Lines, and Sanitary Sewers dated February 28, 2023, and shall hereafter read as attached to Ordinance No. O-2223-24, as may thereafter be amended, and which is incorporated herein by reference.

- (b) The City of Norman Engineering Design Criteria and Standard Specifications and Construction Drawings for Streets, Stormwater, Water Lines, and Sanitary Sewers as referred to above shall not become effective until at least three (3) copies of each have been filed in the Office of the City Clerk for examination by the public.

26-102 Standard Specifications And Construction Drawings And Engineering Design Criteria; Penalties For Violation.

- (a) Any person convicted of violating the provisions of the City's Standard Specifications and Construction Drawings and/or Engineering Design Criteria or material referenced therein, or of failing to act or comply with the provisions thereof, shall be subject to the enforcement mechanisms as set forth more fully therein, and further shall be punished by a fine as provided in the City penalty and fine schedule for each violation or failure to comply
- (b) Each day that a violation or failure to comply exists shall constitute a separate and distinct offense, and any one or more of such offenses may be set out in any citation or complaint or information filed.

§ 5. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance, except that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this _____ day
of _____, 2023.

NOT ADOPTED this _____ day
of _____, 2023.

(Mayor)

(Mayor)

ATTEST:

(City Clerk)

Ordinance No. O-2223-24

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING ARTICLE I of CHAPTER 16 (PUBLIC IMPROVEMENTS) OF THE CODE OF THE CITY OF NORMAN BY ADOPTING AND INCORPORATING BY REFERENCE THEREIN THE CITY OF NORMAN STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS AND THE ENGINEERING DESIGN CRITERIA FOR STREETS, STORMWATER, WATER LINES, AND SANITARY SEWERS DATED FEBRUARY 28, 2023; PROVIDING ENFORCEMENT REMEDIES INCLUDING PENALTIES FOR VIOLATION; AND PROVIDING FOR THE SEVERABILITY THEREOF.

§ 1. WHEREAS the City of Norman is in the process of Municipal Code recodification, which recodification, if approved, would provide for the repeal of certain provisions and for the manner of amendment to the remaining code provisions.

§ 2. WHEREAS the portions of the Norman Municipal Code addressed in this Ordinance would be, upon such recodification, renumbered and modified as set forth in therein.

§ 3. WHEREAS, amendments to the current code which predate the effective date of said recodification shall, upon approval, be fully implemented therein.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

§ 4. That Article I (Public Improvements In General) of Chapter 16 (Public Improvements), which will ultimately be recodified as Article 26-I of Chapter 26, of the Code of the City of Norman shall be amended to read as follows:

126-101 Engineering Design Criteria And Standard Specifications And Construction Drawings For Streets, Stormwater Drainage, Water Lines, And Sanitary Sewers; Adoption and Amendment.

- (a) The City of Norman Engineering Design Criteria and Standard Specifications and Construction Drawings for Streets, Storm Drainage, Water Lines, and Sanitary Sewers as adopted by City Council in Ordinance No. O-9697-13, and as was amended from time to time thereafter, dated September 24, 1996, and amended April 28, 1998; March 28, 2000; May 8, 2001; July 24, 2001, February 26, 2002, September 9, 2003; January 11, 2005; and June 13, 2006, shall be further amended fully replaced with the City Engineering Design Criteria and Standard Specifications and Construction Drawings for Streets, Stormwater, Water Lines, and Sanitary

Sewers dated February 28, 2023, and shall hereafter read as attached to Ordinance No. O-2223-24, as may thereafter be amended, hereto and which is incorporated herein by reference.

- (b) The City of Norman Engineering Design Criteria and Standard Specifications and Construction Drawings for Streets, Stormwater-~~Drainage~~, Water Lines, and Sanitary Sewers as referred to above shall not become effective until at least three (3) copies of each have been filed in the Office of the City Clerk for examination by the public.

126-102 Standard Specifications And Construction Drawings And Engineering Design Criteria; Penalties For Violation.

- (a) Any person convicted of violating the provisions of the City's Standard Specifications and Construction Drawings and/or Engineering Design Criteria or material referenced therein, or of failing to act or comply with the provisions thereof, shall be subject to the enforcement mechanisms as set forth more fully therein, and further shall be punished by a fine of not less than fifty dollars (\$50.00) nor more than seven hundred fifty dollars (\$750.00) as provided in the City penalty and fine schedule for each violation or failure to comply
- (b) Each day that a violation or failure to comply exists shall constitute a separate and distinct offense, and any one ~~(4)~~ or more of such offenses may be set out in any citation or complaint or information filed.

§ 5. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance, except that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this _____ day
of _____, 2023.

NOT ADOPTED this _____ day
of _____, 2023.

(Mayor)

(Mayor)

ATTEST:

(City Clerk)



Standard Specifications and Construction Drawings

February 2, 2023

**Streets
Storm Drainage
Water Lines
Sanitary Sewers**

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City of Norman
STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS
SECTION OUTLINE

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- 1100 General Conditions
- 2100 Site Development and Earth Work
- 2200 Miscellaneous Construction
- 2300 Streets and Drainage
- 2400 Water Lines
- 2500 Sanitary Sewers
- 2600 Sanitary Sewer Lift Station
- 3000 Public Works Administration
- 4000 Construction Drawings

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City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

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City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 1000

GENERAL INFORMATION

1001 PURPOSE

The purpose of these specifications is to establish, where applicable, minimum acceptable standards or a range of acceptable results for construction of public improvements in the City of Norman. The Contractor shall be solely responsible for producing an acceptable end product and exercising control of the project. The City of Norman personnel, except as specifically provided for in these specifications, will perform inspections for the City to determine if an acceptable product is being produced.

1002 INTERPRETATION

These specifications will be interpreted in such a manner as to allow the contractor to control the project in order to produce an acceptable end product. These specifications will not be interpreted in a manner that allows a contractor to produce an unacceptable end product or endanger the public. When disputes arise over interpretation of the specifications, the General Conditions of the Contract will govern. Only projects in substantial conformance with plans and specifications will be accepted by the City of Norman.

1003 APPLICABILITY

1003.1 *CONTRACTORS WORKING FOR THE CITY OF NORMAN*

All applicable portions of these specifications will apply to all contractors working for the City of Norman.

1003.2 *CITY OF NORMAN CONSTRUCTION*

Unless otherwise noted in the contract documents, these specifications will apply to all projects constructed by the Public Works, , Utilities, and Parks and Recreation Departments of the City of Norman.

1003.3 *PRIVATE CONTRACTORS CONSTRUCTING ANY CAPITAL PROJECT THAT WILL BE TRANSFERRED TO THE CITY OF NORMAN*

Except for method of measurement and basis of payment paragraphs, these specifications will apply to all projects constructed by a private contractor that will be transferred to the City of Norman. At the discretion of the developer, the method of measurement and basis of payment may be used.

1004 MATERIALS NOT LISTED IN THESE SPECIFICATIONS

Materials listed in these specifications are those materials normally used by the City of Norman. All materials shall be new (not re-conditioned), recently manufactured and subject to approval by the City of Norman Engineering staff. Any construction materials not approved will be replaced at the expense of the private contractor and/or supplier. This does not preclude the use of other materials by developers, engineers, or contractors. When a material not listed in these specifications is to be used in a project,

the engineer designing the project will provide a draft specification for review. If the draft specification is accepted, the material may be used in the project. The Engineer will approve the material and provide written approval per project.

1004.1 HAZARDOUS MATERIALS

- A. **Hazardous Chemicals:** Anytime and outside contractor brings a hazardous substance(s) into the workplace as outlined by the City of Norman safety manual, the Safety Manager and the construction inspector must receive a CIL (chemical inventory list) and MSDS(s) (material safety data sheet) for those substance(s). Similarly, a CIL and MSDS(s) for all hazardous substances in the area that the contractor will be working must be provided to the contractor. This exchange will be coordinated by whomever is granting the contract.

Service contractors whose work or material pose a health hazard to employees shall be responsible for the training and education requirements outlined under the policy provided by the city of Norman Safety Manager. The training must be documented and the Safety Manager must retain the record of this training in the manner that in-house safety training is cataloged.

Outside contractors must comply with all the provisions of the hazard Communication Standard while working for the City of Norman. Periodic oversight visits from the Safety Manager may be performed to assure compliance.

1005 INSPECTION OF PUBLIC WORKS PROJECTS

All inspections of public works projects will be conducted in accordance with City of Norman Administrative Regulations and Code and good engineering practices.

1006 TESTING REQUIREMENTS

1006.1 APPLICATION OF TEST REQUIREMENTS

- A. **General:** Unless otherwise specified, testing of projects constructed using these specifications will be tested in accordance with this section. Unless otherwise specified, the contractor will provide the equipment, materials, and labor necessary to conduct the required tests. The contractor will coordinate with the Project Inspector for appropriate test dates and the Inspector will observe tests as required. When tests are conducted off site or by a testing laboratory, the Contractor will provide certified copies of the test results. If a project or portion of a project fails to meet the required test results, the contractor will take appropriate corrective action and the test shall be conducted again on the corrected work. Corrections to work and additional testing shall be at the contractor's expense.
- B. **Test Specimens:** It shall be the responsibility of the Contractor to furnish evidence to the City that the quality of the materials and workmanship entering in to the work complies with the plans and specifications in order to accomplish this. The minimum schedule of satisfactory tests listed herein shall be performed by a testing laboratory approved by the City. When tests reveal that the quality of materials or workmanship does not meet the requirements of the specifications, additional tests shall be made as directed by the City Engineer or designee until the number of satisfactory tests called for in the schedule have been made. The City will pay the cost of all initial testing of work which passes the requirements. The Contractor will pay for two (2) passing tests for each failed test. This cost will be deducted from the Contractor's Pay Estimate. The developer of a

subdivision which requires public improvements shall pay the cost of all testing, including subgrade densities, paving densities, concrete strength tests, paving thickness cores, etc.

- C. **Test results:** All test results shall be provided to the City of Norman within 5 working days of the test sample being taken in the field.

1006.2 **PAVING, CONCRETE AND COMPACTION TESTING**

- A. Concrete Test Schedule:

<u>Description</u>	<u>Test Method</u>	<u>Quantity Represented One Test</u>
Concrete Cylinder	AASHTO T-23	50 CY Concrete
Entrained Air Content	AASHTO T-152	50 CY Concrete
Slump	AASHTO T-119	50 CY Concrete

- One test for concrete cylinders shall be construed to mean that at least four test specimens shall be taken in accordance with the above schedule. Two shall be tested at an age of seven days, and two shall be tested at an age of twenty-eight days, and the strength determined from the average of these pairs of test specimens. A minimum of one test (four specimens) shall be taken for each day's work. Beam and cylinder specimens taken in the field shall be made and cured in accordance with AASHTO T-23. One test for entrained air content shall be made for each set of four concrete cylinder specimens taken.
- Job-Mix Design.** The Contractor shall provide the City with a complete job-mix design performed by a laboratory, approved by the City. A design need not be performed for each project, but the design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor will be responsible for the cost of this testing, unless otherwise stated in the Special Conditions. A new job-mix design will be performed if the sources of is changed during the project.

- B. Asphalt Testing Schedule:

- General.** The following testing will be required on asphalt mixes produced under these specifications.
- Job-Mix Design.** The Contractor shall provide the City with a complete job-mix design performed by a laboratory, approved by the City. A design need not be performed for each project, but the design for each project must have been accomplished not longer than six months before the commencement of the project. The Contractor will be responsible for the cost of this testing, unless otherwise stated in the Special Conditions. A new job-mix design will be performed if materials sources are changed during the project.
- Aggregates.** The Contractor shall, upon request, provide the City with copies of the tests required by ODOT 708.02 for each aggregate to be used on this project.

4. **Asphalt.** The Contractor shall obtain from his asphalt supplier, and furnish the City with a Certificate of Analysis of each different type and grade of asphalt used on the project. All asphalt products will be required to meet the provisions of Section 708-3 of the latest edition of Standard Specifications for Highway Construction of the Oklahoma Department of Transportation.
5. Schedule:

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Roadway & Lab Molded Core Density <u>See Note # 1, 2 & 3</u>	Roadway Density OHDL-14 METHOD "A" Lab molded Density OHDL-14 method "B" & OHDL-8	3 Cores per days run up to <u>875 T</u>
Extraction & Gradation <u>See Note # 1, 2 & 3</u>	AASHTO T-11 AASHTO T-27 AASHTO T-30 AASHTO T-164 AASHTO T-308 or OHDL 26	1 test per days run up to 875 T
Rice Test <u>See Note # 1, 2 & 3</u>	AASHTO T-209	1 test minimum per type of mix per project.

Notes

- 1) Additional tests will be required when the same type of mix is not placed in consecutive days, a change in the mix design or plant failure.
- 2) Definition of a lot: A lot is the tons of asphalt placed in one day up to 875 T.
- 3) Test results are to be recorded on ODOT Asphalt Plant Inspector's Work Sheet.

C. Subgrade Test Schedule

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Standard Proctor Density	AASHTO T-99	As differing soil conditions require.
P.I.	AASHTO T-89 AASHTO T-90	As differing soil conditions require.
Field Density: Subgrade and/or sand bedding	AASHTO T-238	575 SY of subgrade or 200' for 26' street
C.B.R. Lab Test Field Test	ASTM D-1883 ASTM D-4429	Min. 1 per Soil Type or as required by the City Engineer

D. Trench Backfill Test Schedule

<u>Description</u>	<u>Method of Test</u>	<u>Quantity of Item Represented by One Test</u>
Standard Proctor Density	AASHTO T-99	As differing soil conditions require 1 test every 300' of trench for each 4' lift. 1 test every 200' of Bedding Material.
Field Density	AASHTO T-238	

E. Surface Coring Schedule

1. Schedule:

<u>Street Classification</u>	<u>Core Interval</u>
Residential	300'
Collector	230'
Arterial	
- Full Width	150'
- Half Width	300'

2. Core hole shall be patched immediately with the following material:

- (a) Concrete Paving: PCC grout, Class A
- (b) Asphalt Paving: PCC grout, Class A; Hot mix, cold laid asphalt per ODOT 708.04, or approved equal.

1006.3 WATER LINE TESTING

Conduct testing as stipulated in Specification Section 2403.9

1006.4 SANITARY SEWER FORCE MAIN PRESSURE TESTING

- A. **Preparation:** Prior to starting the pressure test the Contractor will flush the line of all dirt and debris. The Contractor will also evacuate all air from the line. This work will be coordinated with the Utilities Inspector and the Line Maintenance Division of the Utilities Department.
- B. **Procedure:**
 - 1. The Contractor will bring the line up to test pressure of 100 psi or 1.5 times the design pressure (whichever is greater) and the line must maintain that pressure for a period of 120 minutes with not more than a 5 psi drop. If the line does not pass the pressure test, then the contractor must repair the lines so that it will meet the test requirements.
- C. **Required Results:** Hold 1.5 times the working pressure of the line for 120 minutes with a drop of 5 psi or less.
- D. **Inspection Requirements:** Contractor cannot begin or complete any testing without permission from the Project Inspector.

1006.5 SANITARY SEWER LINES MANDREL AND PRESSURE TESTING

- A. **Preparation:** The Contractor will ensure that the line is clean and all debris has been removed from manholes. The Contractor will coordinate with the Project Inspector to have the lines tested with a mandrel prior to pressure testing.
- B. **Procedure:**

1. Mandrel Test (Required on flexible pipe only): The contractor will have personnel pull the required size mandrel through the line while the Project Inspector observes. This test will be conducted at least 30 days after the line has been installed.
 - (a) The mandrel shall have a diameter equal to 95% of the inside diameter of the pipe.
 - (b) The test shall be performed without mechanical pulling devices.
 - (c) If the line does not meet test requirements, the contractor will make necessary repairs and retest.
2. Pressure Test:
 - (a) The Contractor will plug both ends of the line and pressure the line to 4 psi.
 - (b) When the line is at pressure the Project Inspector will observe the pressure gage for 7 minutes.
 - (c) If the line does not meet test requirements, the contractor will make necessary repairs and retest.
 - (d) When the test is completed, the contractor will remove all plugs and ensure the line is clear.
- C. Required Results:
 1. The Mandrel must pass through the line and no pipe shall exceed a deflection of 5%.
 2. The line must hold 4 psi of air pressure for 7 minutes.
- D. **Inspection Requirements:** Contractor cannot begin or complete any testing without permission from the Project Inspector.
- E. **Alternative Inspections:** In special circumstances and with acceptance by the Engineer, the following alternative tests may be substituted for the pressure test detailed above.
 1. **Joint Testing:** On 24" and larger diameter lines.
 2. **Exfiltration Test:** Conducted in accordance with standard industry practices.
 3. **Infiltration Test:** Conducted in accordance with standard industry practices.

1006.6

SANITARY SEWER LINES DYE TESTING

- A. **Required For:** Gravity sanitary sewer line replacement projects. Normally this will be a City Contract or work performed by Utilities Department crews.
- B. **Preparation:** The Contractor will ensure that the line is clean and all debris has been removed from manholes. The contractor will prepare the water source with sufficient sewer line marking dye, to give the water a highly visible color.
- C. Procedure:
 1. A rigid pipe connected to a water source will be used to inject dye colored water, under pressure, into the material surrounding the gravity sewer.
 2. The dye injection will start 10' upstream of the lowest manhole and will

proceed upstream in 10' increments. The dye will be injected until, in the opinion of the Utility Inspector, the area is saturated.

3. Dye will be injected in the vicinity of all service taps.
4. The Utility Inspector will observe the down stream manhole and if dye appears in the manhole, the line has failed the test. If the line fails the test, the contractor will make necessary repairs and retest.

D. **Required Results:** No dye to enter the line.

E. **Inspection Requirements:** Contractor cannot begin or complete any testing without permission from the Project Inspector.

1006.7

MANHOLE INSPECTION/TESTING

A. **Required For:** In accordance with ODEQ 252:656-5-4(g)(5) a manhole leakage test must be performed.

1. Manholes that are concrete and poured monolithically; and subsequent to all pipe connections in place to the manhole (normal lateral, lineal, or drop connection); and all connections having water stop gaskets cast within the manhole; and cast-in-place manhole barrel sections in a continuous pour without seams or joints shall be tested in accordance with the procedure outlined below.
2. For pre-cast manholes, a list of acceptable manhole manufacturers must be provided with each manufacturer providing written certification of satisfactory manufacturer manhole leakage testing. Any pre-cast manhole apparently damaged during the construction process must be tested for leakage in accordance with the procedure outlined below, and repaired, if required by the Engineer

B. **Preparation:** The contractor will ensure that the manholes to be inspected are clean, properly grouted, and that the appropriate rings and lids have been installed.

C. **Procedure:**

1. Test manholes for leakage separately and independently of the wastewater lines by vacuum testing. Test manholes after installation with all connections (existing and /or proposed) in place. Plug lift holes with an approved non-shrink grout prior to testing. Install drop-connections and gas sealing connections prior to testing.
2. **Vacuum Test:** Temporarily plug lines entering the manhole with the plugs braced to prevent them from being drawn into the manhole. Install plugs in the lines beyond drop-connections, gas sealing connections, etc. Place the test head inside the frame at the top of the manhole and inflate in accordance with the manufacturer's recommendations. Draw a vacuum of 10 inches of mercury, then turn off the vacuum pump. Read the level of vacuum after the required test time with the valve closed. The manhole will pass the test if the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury). The required test time for 48-, 60-, and 72-inch manholes with depths up to 30 feet is 2 minutes. Test times for manholes of greater size and depths will be determined by the Engineer.
3. **Visual Inspection:** For manholes that fail the vacuum test a visual inspection will be conducted to try and determine the source of the leakage.

4. **Dye Test:** If a visual inspection is unsuccessful in identifying the source of the leakage a dye test shall be conducted. The procedure for the dye test will be as follows:
 - (a) The dye injection will be at 4 equally spaced locations around the manhole.
 - (b) Dye will be injected until, in the opinion of the Project Inspector, the area is saturated.
 - (c) The Project Inspector will observe the manhole for 30 minutes and if dye appears on the walls of the manhole, the manhole has failed the test. If the manhole fails the test, the contractor will make necessary repairs and retest.
 5. **Manhole Repairs:** Repair any manhole which fails the leakage testing process with non-shrink grout or other suitable material as determined for the material from which the manhole is constructed. Retest the manhole as described above until a successful test is achieved. Remove all temporary plugs and grout after a successful test.
- D. **Inspection Requirements:** Contractor cannot begin or complete any testing without permission from the Project Inspector.

1006.8

STORM SEWER PIPE INSPECTION/TESTING

- A. **Preparation:** The Contractor will ensure that the line is clean and all debris has been removed from manholes and drop inlets.
- B. **Frequency:** Each line from manhole to manhole or drop inlet will be tested. If the inspector suspects a portion of the line was not properly installed, a dye test of that portion of the line may be required.
- C. **Procedure:**
 1. If a dye test is required, it will be prepared in the same manner as a sewer line test except:
 - (a) The dye injection will be at equally spaced locations around the section in question.
 - (b) Dye will be injected until, in the opinion of the Project Inspector, the area is saturated. The Project Inspector will observe the line for 30 minutes and if dye appears in the line, the line has failed the test. If the line fails the test, the contractor will make necessary repairs and retest.
- D. **Inspection Requirements:** The Utilities Inspector will be on site to observe all mandrel and dye testing, if required.

1006.9

STORM SEWER DROP INLETS AND JUNCTION BOXES INSPECTION/TESTING

- A. **Preparation:** The contractor will ensure that the drop inlets and junction boxes to be inspected are clean, properly grouted, and that the grates or rings and lids have been installed.
- B. **Frequency:** The Utilities Inspector may request that a drop inlet or junction box that does not appear to meet specifications be tested by dye testing.
- C. **Procedure:**

1. The Inspector will visually inspect each drop inlet and junction box for compliance with the specifications.
2. If a dye test is required it will be prepared in the same manner as a line test except:
 - (a) The dye injection will be at 4 equally spaced locations around the drop inlet or junction box.
 - (b) Dye will be injected until, in the opinion of the Project Inspector, the area is saturated.
 - (c) The Project Inspector will observe the drop inlet or junction box for 30 minutes and if dye appears on the walls of the drop inlet or junction box, the drop inlet or junction box has failed the test. If the drop inlet or junction box fails the test, the contractor will make necessary repairs and retest.
- D. **Required Results:** The drop inlet or junction box must meet specifications and if dye testing is required then no dye shall enter the drop inlet or junction box.
- E. **Inspection Requirements:** The Utilities Inspector will be on site to observe all testing.

1007 SUBMITTALS

Submittals will be provided to the Design Engineer or Utilities Engineer as required by the specifications or during the pre-construction conference. The submittals will be reviewed and accepted or returned for additional information within two weeks after receipt. The following guidelines will apply unless the contractor is notified otherwise:

1007.1 MATERIALS

Material submittals will be made and approved by the engineer or his authorized representatives before the material is installed. If the material manufacturer's installation recommendations are more restrictive than the city's, then the manufacturer's recommendations shall govern.

1007.2 WORKING DRAWINGS

Working drawings shall be provided prior to starting work on the items covered by the drawings.

1008 ABBREVIATIONS

Wherever the following abbreviations are used in Contracts, Proposals, these Specifications or on Plans, they are to be construed the same as the respective expressions represented:

AASHTO	American Association of State Highway and Transportation Officials
AIA	American Institute of Architects
ANSI	American National Standards Institute (United States of America Standards Institute)
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASTM	American Society of Testing and Materials
AWPA	American Wood Preservers Association

AWWA	American Water Works Association
AWS	American Welding Society
CIL	Chemical Inventory List
ITE	Institute of Transportation Engineers
MSDS	Material Safety Data Sheet
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
ODEQ	Oklahoma Department of Environmental Quality
ODOT	Oklahoma Department of Transportation
OSHA	Occupational Safety and Health Administration
UL	Underwriter's Laboratory
WEF	Water Environment Federation

1009 DEFINITIONS

ADVERTISEMENT: All of the legal publications pertaining to the work contemplated or under Contract.

AWARD: The decision of the Owner to accept the proposal of the lowest and best bidder for the work, subject to the execution and approval of a satisfactory contract and the required bonds therefor, and to such other conditions as may be specified or otherwise required by law.

BIDDER: Any person or persons, partnership, company, firm or corporation acting directly through a duly authorized representative submitting a proposal for the work contemplated.

BASE COURSE: The layers of selected material of a designated thickness placed on a subbase or a subgrade to support a surface course.

CALENDAR DAY: Any day shown on the calendar beginning and ending at midnight.

CHANGE ORDER: A written order issued by the City to the Contractor, covering changes within the scope of the Contract and establishing the basis of payment and time adjustments for the work affected by the changes.

CHANNEL: A natural or artificial water course.

CITY: The City of Norman, Oklahoma, a Municipal Corporation, acting through its duly authorized assistants or agents.

CITY ATTORNEY: The City Attorney of the City of Norman, Oklahoma, or his duly authorized assistants or agents.

CITY CLERK: The City Clerk of the City of Norman, Oklahoma, or her duly authorized assistants or agents.

CITY CONTROLLER: The City Controller of the City of Norman, Oklahoma, or his duly authorized assistants or agents.

CITY MANAGER: The Manager of the City of Norman, Oklahoma

COMPLETION DATE: The date on which the Contract work is completed.

CONSTRUCTION: Any alteration of land for the purpose of achieving its development or changed used, including particularly any preparation for, building of, or erection of a structure.

CONTRACT: The written agreement between the City and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment. The contract includes the Invitation for Bids, Proposal, Contract Form,

all Contract Bonds, Specifications, Supplemental Specifications, Special Provisions, all Plans, and the Work Order, also any Change Orders and Supplemental Agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions.

CONTRACT ADMINISTRATOR: The contract administrator is the City employee assigned responsibility for coordination with the contractor and administration of the contract.

CONTRACT ITEM (PAY ITEM): A specifically described unit of work for which a price is provided in the Contract.

CONTRACT TIME: The number of workdays or calendar days allowed for completion of the Contract, including authorized time extensions.

CONTRACTOR: The individual, partnership, joint venture, firm or corporation contracting with the City or other public entity for performance of prescribed work. This includes a private contractor constructing improvements for a developer that will be transferred to the City of Norman. This also includes a contractor working for Oklahoma Department of Transportation.

COUNCIL: The Council of the City of Norman, Oklahoma.

CULVERT: Any structure under the roadway with a clear opening of twenty (20) feet or less measured along the center of the roadway.

DETENTION: A temporary storage of a determined quantity of water for a specified period of time with a release rate that is either fixed or variable.

DEVELOPER: Any person, persons, corporation, or other entity who in his or her own behalf, or as an agent of another, engages in development, subdivision, construction of structures, or alteration of land in preparation thereof.

DRAINAGE DITCH: An open excavation or ditch constructed for the purpose of carrying off surface water.

DRAINAGE MASTER PLAN: The City of Norman Drainage Plan for the Canadian River and Little River Drainage Basin and all drainage systems related thereto.

DRAINAGE SYSTEM: The surface and subsurface system for the removal of water from the land, including both the natural elements of streams, marshes, swales, and ponds, whether of an intermittent or continuous nature, and the man-made element which includes culverts, ditches, channels, retention facilities, detention facilities, gutters, streets, and storm sewer systems.

EARTH CHANGE: Excavation, grading, regrading landfilling, berming or diking of land.

EARTH CHANGE PERMIT: Written permission issued by the City Engineer authorizing any person, firm or corporation to an earth change in conformance with an approved plan within the City of Norman.

EASEMENT: A grant of the right of use of property of an owner for a certain purpose at the will of the grantee.

ENGINEER: The City Engineer and such Assistants or Representatives as authorized by the City Manager while acting within the scope of their assigned duties or vested authority.

EQUIPMENT: All machinery, tools and apparatus necessary for the proper construction and acceptable completion of work.

EXTRA WORK: Any work performed by the Contractor not provided for by the plans.

FINAL ACCEPTANCE DATE: The date upon which the completed work is accepted by the City without exception or reservation.

FURNISH: To supply.

GUARANTY: Furnished by the bidder as a guarantee of good faith to enter into a contract with the City and to execute the required bonds for the work contemplated after the work is awarded to him and as liquidated damages in event of failure to do so.

HOLIDAYS: Any day proclaimed a holiday by the City.

HVEEM STABILITY TEST: Asphaltic concrete test that measures the asphaltic concrete mix's resistance to lateral displacement under vertical loading.

LABORATORY: The official testing laboratory of the City or any other testing laboratory which may be designated by the City Engineer.

MAINTENANCE BOND: The approved form of security furnished by the Contractor and his Surety as a guarantee that he will maintain the work constructed by him in good condition for the period of time required.

MATERIALS: Any substances used in the construction of the project and its appurtenances.

MAYOR: The Mayor of the City of Norman, Oklahoma.

NATURAL DRAINAGE: The dispersal of surface waters through ground absorption and by drainage channels formed by the existing surface topography which exists at the time of adoption of this document or formed by any natural or approved man-made changes in the surface topography.

NOTICE TO PROCEED: Written notice to the Contractor to proceed with the Contract work not later than the date specified.

OWNER: City of Norman, a Municipal Corporation, acting through its duly authorized representatives or agents.

PAVEMENT STRUCTURE: The combined subbase, base and surface courses placed on the subgrade to support the traffic load and distribute it to the roadbed.

PERFORMANCE BOND: The approved form of security furnished by the Contractor as a guarantee of good faith on the part of the Contractor to execute the work in accordance with the plans and specifications and terms of the Contract.

PIPE BEDDING: Material placed in the bottom of the excavation which serves as the base for the pipeline.

PLANS: The accepted plans, profiles, typical sections, cross sections, working drawings and supplemental drawings, or exact reproductions thereof, which show the location, character, dimensions, and details of the work to be done.

PROJECT INSPECTOR: An authorized Representative of the City assigned to make detailed inspections of Contract performance.

PROJECT: The specific pipelines, facilities, and all appurtenances and construction to be performed under the Contract.

PROPOSAL: The written statement or statements duly filed with the City of the person or persons, partnership, company, firm or corporation proposing to do the work contemplated. The term "Bid" as used herein shall refer to and mean "Proposal".

PROPOSAL FORM: The approved form on which the formal bids for the work are to be prepared and submitted.

PROPOSAL GUARANTY: The security, designated in the "proposal form" and in the "Advertisement," to be furnished by the bidder as a guarantee of good faith to enter into a contract with the City and to execute the required bonds for the work contemplated after the work is awarded to him and as liquidated damages in event of failure to do so.

PROVIDE: To furnish and erect or install.

RIGHT-OF-WAY: A general term denoting land, property, or an interest therein, acquired for highway purposes.

SIDEWALK: That portion of the Right-of-Way constructed for the use of pedestrians.

SPECIAL CONDITIONS: The special clauses setting forth conditions or requirements peculiar to the specific project involved, supplementing the General Conditions and taking precedence over any conditions or requirements of the General Conditions with which they are in conflict.

SPECIFICATIONS: The compilation of provisions and requirements for the performance of prescribed

work.

STANDARD SPECIFICATIONS: The book of Specifications approved for general application and repetitive use.

STATUTORY BOND: The approved form of surety set up and furnished by the Contractor and his Surety as a guarantee that he will pay, in full, all bills and accounts for material and labor used in the construction of the work, as provided by law.

STRUCTURE: Bridge, culvert, catch basin, drop inlet, retaining wall, cribbing, manhole, endwall, headwall, building, sewer, service pipe, underdrain, and foundation drain and other features which may be encountered in the work and not otherwise Classified.

SUBBASE: The layer or layers of selected material of a designed thickness placed on a subgrade to support a base course.

SUBGRADE: The top surface of a roadbed upon which the pavement structure and shoulders are constructed.

SUBMITTALS: Those items which must be submitted and reviewed by the City prior to work on an item or during work on an item. This may include working drawings, supplier certifications, test results, and other types of information.

SUPERINTENDENT: The representative of the Contractor present at all times during progress of the work, capable of supervising the work effectively and authorized to make binding decisions for the Contractor.

SURETY OR SURETIES: The corporate body which is bound by such bonds as are required with and for the Contractor and engages to be responsible for the entire and satisfactory fulfillment of the contract, and for any and all requirements as set out in the specifications, contract or plans.

SURFACE COURSE: One or more layers of a pavement structure designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is sometimes called the "Wearing Course."

WORK: Work shall mean the furnishing of all labor, materials, equipment, and other incidentals necessary to the successful completion of the project and the carrying out of all the duties and obligations imposed by the Contract.

WORKING DRAWINGS: Stress sheets, shop drawings, erection plans, false-work plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for review.

END OF SECTION 1000

City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 1100

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City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 1100 GENERAL CONDITIONS

1101 DEFINITION OF TERMS

1101.1 DEFINITIONS

Wherever the words, forms, or phrases herein defined or pronouns used in their stead occur in these specifications, in the contract or in the Advertisement of any document or instrument herein contemplated or to which these specifications apply, the intent and mean shall be interpreted as defined in Sections 1008 and 1009.

1102 INFORMATION AND REQUIREMENTS FOR BIDDERS

1102.1 CONTENT OF PROPOSAL FORMS

The City will furnish bidders with proposal forms which will state the general location and description of the contemplated work and will contain a list of the items of work to be done and upon which bid prices are asked. The PROPOSAL form will state the time limits for commencing and for completing the work and will provide for entering the amount of the proposal guaranty. The PROPOSAL form will contain a Non collusion Affidavit. In addition to the Non collusion affidavit, bidders must complete, sign and have notarized such additional affidavits as are included in the Proposal.

1102.2 INTERPRETATION OF PLANS AND SPECIFICATIONS

If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or other proposed contract documents, he may submit to the Engineer a written request for an interpretation thereof. The person submitting such request will be responsible for its prompt delivery. An interpretation of the proposed documents will be made only by addendum, duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. The City will not be responsible for any other explanations or interpretations of the proposed documents.

1102.3 EXAMINATION OF DOCUMENTS AND SITE OF THE WORK

Bidders are advised that the plans and specifications of the Engineer on file with the City shall constitute all the information which the City will furnish. No other information given by the City or any official thereof prior to the execution of the contract shall ever become a part of or change the contract, plans or specifications, or be binding on the City. Bidders are required, prior to submitting any proposal, to read carefully the specifications, the proposal, contract and bond forms; to examine carefully all plans on file; to visit the site of the work; to examine carefully local conditions; to inform themselves by their independent research of the difficulties to be encountered and judge for themselves of the accessibility of the work and all attending circumstances affecting the cost of doing the work or the time required for its completion, and obtain all information required to make an intelligent proposal. Bidders shall rely exclusively upon their own estimates, investigations and other data which are necessary for full information

upon which the proposal may be based. Submission of a proposal will be evidence that the Bidder has made the examinations and investigations required herein.

1102.4 PREPARATION OF PROPOSAL

The bidder shall submit his proposal and non-collusion affidavit on the forms furnished. All blank spaces in the proposal form shall be correctly filled in and the bidder shall state the prices, written in ink, both in words and numerals, for which he proposes to do the work contemplated or furnish the materials required. Such prices shall be written distinctly legibly. In case of conflict between words and numerals, the words shall govern. If the proposal is submitted by a firm or partnership, the name and post office box address of each member must be given, and the proposal signed by a member of the firm or partnership who is a person duly authorized to act for the partnership in the submission of the proposal. If the proposal is made by a company or corporation, the company or corporate name and the state under the laws of which said company or corporation is chartered and the business address must be given, and the proposal signed by an official or agent who is a person duly authorized to act for the company or corporation in the submission of the proposal. Powers of attorney, authorizing agents or others to sign proposals must be properly certified and must be in writing and on file with the City Clerk or submitted with the proposal.

1102.5 PROPOSAL AFFIDAVIT

Each proposal shall be accompanied by a sworn statement in writing that the person signing the proposal executed said proposal in behalf of the bidder therein named, and that he had lawful authority to do so, and that said bidder has not directly or indirectly entered into any agreement, express or implied, with any other bidder or bidders having for its object the controlling of the amount of such bid or any bids, the limiting of the bids or bidders, the parceling or farming out to any bidder or bidders or other persons of any part of the contract or any bid, or the subject matter of the bid or the profits thereof, and that he has not and will not divulge said sealed bid to any person whatever except those having a partnership or other financial interest with him in said bid, until after the said sealed bids are opened.

1102.6 PROPOSAL GUARANTY

Proposals will not be considered unless the original filed with the Purchasing Agent is accompanied by a Bidder's Bond, or certified or cashier's check in the required amount, made payable to the "City of Norman." The check shall be in the amount as designated in the Advertisement. The Proposal Guaranty is required as evidence of good faith and as a guarantee that, if awarded the Contract, the Bidder will execute the Contract and furnish the required bonds within the required time.

1102.7 FILING OF PROPOSALS

File proposals in a manner and within the time limit for receiving proposals, as stated in the Advertisement. Hard copy proposals shall be plainly marked on the envelope with the word "Proposal" and the name of the project.

1102.8 WITHDRAWAL OF PROPOSALS

Permission will not be granted to withdraw or modify any proposal after it has been filed and before the time set for opening proposals. Request for non-consideration of proposals must be made in writing, addressed to the City Council, and filed with the Purchasing Agent before the time set for opening proposals. After other proposals are opened and

read, the proposal for which withdrawal is properly requested will be returned unopened.

1102.9 OPENING OF PROPOSALS

The proposals filed with the Purchasing Agent will be opened at the time stated in the Advertisement and shall thereafter remain on file in the Office of the Purchasing Agent two (2) days before any Contract will be entered into, based on such proposals. Bidders are invited to attend the opening of the proposals.

1102.10 IRREGULAR PROPOSALS

Proposals will be considered irregular if they show any omissions, alterations of forms, additions or conditions not called for, unauthorized alternate bids, or irregularities of any kind. However, the City reserves the right to waive technicalities as to changes, alterations or reservations, and make the award in the best interest of the City.

1102.11 REJECTION OF PROPOSALS

The City reserves the right to reject any or all proposals, and all proposals submitted are subject to this reservation. Proposals may be rejected for any of the following specific reasons:

- A. Proposals/bids received after the time limit for receiving proposals/bids as stated in the Advertisement.
- B. Proposal/bid prices obviously unbalanced.
- C. Summation of proposal/bid prices on any one project above the Engineer's estimate of cost for such project.
- D. Proposals/bids containing any irregularities.
- E. Proposals/bids received more than ninety-six (96) hours, excluding Saturday, Sunday, and Holidays, before the time set for the opening of bids.

1102.12 DISQUALIFICATION OF BIDDERS

Bidders may be disqualified, and their proposals not considered for any of the following specific reasons:

- A. Where more than one proposal for an individual, firm, partnership or corporation is filed under the same or different names, and where such proposals are not identical in every respect.
- B. Reasonable grounds for believing that any Bidder is interested in more than one proposal for the work contemplated or materials to be furnished.
- C. Reason for believing that collusion exists among the Bidders.
- D. The bidder being in arrears on any existing contracts, interested in any litigation against the City, or having defaulted on a previous contract.
- E. Lack of competency as revealed by the Financial Statement, Experience and Equipment Questionnaire, etc.
- F. Uncompleted work, which, in the judgment of the City, will hinder or prevent the prompt completion of additional work if awarded.

1103 AWARD AND EXECUTION OF CONTRACT

1103.1 CONSIDERATION OF PROPOSALS

After the proposals are opened, those proposals containing unit prices will be tabulated for comparison on the basis of the quantities shown in the approximate estimate. Until the execution of the contract with the successful bidder, the City reserves the right to reject any or all proposals, to waive technicalities, and to advertise for new proposals, or proceed to do the work otherwise when the best interest of the City will be promoted thereby.

1103.2 AWARD OF CONTRACT

The City reserves the right to withhold the award of the contract for a reasonable period of time from the date of opening the proposals, and no award will be made until the necessary investigations are made as to the responsibility of the low bidder.. The awarding of the contract shall give the bidder no right of action or claim against the City upon such contract until the execution of the contract shall have been completed and the contract delivered to the Contractor. The City reserves the right to award all or any portion or portions of the work.

1103.3 RETURN OF PROPOSAL GUARANTY

As soon as the proposal prices have been compared, the City may, at its discretion, return the proposal guaranties accompanying those proposals, which in its judgment would not be considered in making the award. Should the awarding of the contract be delayed more than thirty (30) days, all Bidders' checks will be returned, unless such delay is from causes beyond the control of the City, and in such event, the proposal and Bidder's Check of any Bidder will be returned at the Bidder's option.

1103.4 BONDS - PERFORMANCE, STATUTORY, AND MAINTENANCE

- A. With the execution and delivery of the Contract, the Contractor shall furnish and file with the City, in the amounts required, the following surety bonds:
 1. A good and sufficient Performance Bond in an amount equal to one hundred (100) percent of the approximate total amount of the Contract, guaranteeing the full and faithful execution of the work and performance of the Contract and for the protection of the City and all property owners interested, against any damage by reason of negligence of the Contractor, or the improper execution of the work or the use of inferior materials.
 2. A good and sufficient Statutory Bond in an amount equal to one hundred (100) percent of the approximate total amount of the Contract, guaranteeing payment for all labor, materials, and equipment used in the construction of the improvements.
 3. A good and sufficient Maintenance Bond in an amount equal to (see below) percent of the total amount of the Contract, guaranteeing the maintenance in good condition of such improvement for a period of (see below) year(s)' from and after the time of the completion and acceptance by the City of said improvements.

Type of Construction	Publicly Financed Projects		Privately Financed Projects	
	% of Contract	Maintenance Bond Period (years)	% of Contract	Maintenance Bond Period (years)
Water	100 1 st year 15 2 nd year	2	50 1 st year 15 2 nd year	2
Sanitary Sewer	100 1 st year 15 2 nd year	2	50 1 st year 15 2 nd year	2
Street and Storm Sewer	100 1 st year 15 2 nd to 5 th years	5	25	3

Should repairs on the project be necessary during the maintenance bond period, the repairs made shall also be bonded for an additional 1-year period from the date of completion and acceptance of the repair work by the City.

- B. No Surety will be accepted who is now in default or delinquent on any bond or who is interested in any litigation against the City. All bonds shall be made on forms furnished by the City and shall be executed by surety companies licensed to do business in the State of Oklahoma and acceptable to the City. Each bond shall be executed by the Contractor and the Surety. Should any Surety on the Contract be determined unsatisfactory at any time by the City, notice will be given to the Contractor to that effect, and the Contractor shall forthwith substitute a new Surety or Sureties satisfactory to the City. No payment will be made under the Contract until the new Surety or Sureties, as required, have qualified and been accepted by the City. The Contract shall not be operative nor shall any payments be due until acceptance of the bonds by the City.
- C. All bonds shall be in the forms prescribed by Law or Regulation or by the Contract Documents and be executed by such sureties as are named in the current list of "Companies on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

1103.5 EXECUTION OF CONTRACT

The person or persons, partnerships, company, firm or corporation to whom a contract is awarded shall, within the time set forth in the proposal, sign the necessary agreements entering into the required contract with the City, and execute and deliver the required bonds.

- A. No contract shall be binding on the City until it has been reviewed by the City Council, executed by the City, and delivered to the Contractor.

1103.6 FAILURE TO EXECUTE CONTRACT

Upon failure of the Bidder to execute the required bonds or to sign the required contract within fifteen (15) days after the contract is transmitted to the Contractor, he will be considered to have abandoned his proposal. By reason of the uncertainty of market prices of the materials and labor and it being impracticable and extremely difficult to fix the amount of damages to which the City would be put by reasons of said Bidder's failure to execute said Bonds and Contract, the proposal guaranty accompanying the proposal shall be the agreed amount of damages which the City will suffer by reason of such failure on the part of the Bidder and shall thereupon be retained by the City as liquidated damages. The filing of a proposal will be considered as an acceptance of this provision.

1104 SCOPE OF WORK

1104.1 MEANING AND INTENT OF PLANS AND SPECIFICATIONS

- A. It is the intent of these plans and specifications to prescribe a complete work or improvement, which the Contractor undertakes to do in full compliance with the plans, specifications, special provisions, proposal and contract. The Contractor shall do all work as provided in the plans, special provisions, specifications, proposal and contract, and shall do such additional, extra and incidental work as may be considered necessary to complete the work in a satisfactory and acceptable manner. He shall furnish all labor, materials, tools, equipment and incidentals necessary to the prosecution of the work, unless otherwise specified.
- B. The Contractor shall examine all drawings prior to bidding, and shall require his various subcontractors and materials suppliers to provide items of work shown on any of the plans and to provide necessary utility connections.
- C. The Engineer shall decide the meaning and intent of any portion of the specifications, and of any plans or drawings where same may be found obscure or be in dispute.
- D. It is the intent that this be a complete project as far as the Contract Documents (contract, drawings and specifications) set forth. It is not the intent that different phases of the work on- this project be delegated to various trades and subcontractors by the Contract Documents. The Contractor must make his own contracts with the various subcontractors, setting forth the work these subcontractors will be held responsible for. The Contractor, alone, will be held responsible by Engineer and City for the complete project.
- E. Where the words "furnish", "provide", and/or "install" are used, it shall be interpreted to mean that the Contractor is responsible for furnishing, providing and installing, ready for successful and continuous use, all items of work, whether by his own men or his subcontractors and suppliers. The words "Contractor shall" in most instances have been omitted and simple directive statements have been made. These omitted words shall be supplied by inference. Omission of these words shall not release the Contractor from any work called for on this project. The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled, either on the drawings or in the specifications, or both, including all labor, materials, equipment and incidentals necessary and required for completion.

1104.2 SPECIAL PROVISIONS

Should any work or any conditions which are not thoroughly or satisfactorily stipulated or

covered by the general or standard conditions be anticipated on any proposed work, "Special Conditions" for such work shall be prepared and shall be considered as a part of the specifications and contract.

1104.3 *INCREASED OR DECREASED QUANTITIES OF WORK*

- A. The City reserves the right to alter the quantities of the work to be performed or to extend or shorten the improvement at any time when and as found necessary and the Contractor shall perform the work as altered, increased or decreased, at the contract unit prices. No allowance will be made for any change in anticipated profits, nor shall such changes be considered as waiving or invalidating any condition or provision of the contract.
- B. This provision shall not be construed as to permit the Contractor to perform additional work not included or contemplated in the original proposal.

1104.4 *ALTERATIONS OF PLANS AND SPECIFICATIONS*

The City reserves the right to make such changes in the plans and in the character of the work as may be necessary or desirable to insure completion of the work in the most satisfactory manner, provided such changes do not materially alter the original plans and specifications or change the general nature of the work as a whole. Such changes shall not be considered as waiving or invalidating any condition or provision of the contract.

1104.5 *EXTRA WORK*

When any work is necessary to the proper completion of the project for which no prices are provided in the proposal or contract, the Contractor shall do such work but only when and as ordered in writing by the Engineer and with the prior review by the City.

1104.6 *FINAL CLEANING UP*

Upon completion of the work, and before acceptance and final payment will be made, the Contractor shall clean and remove from the site of the work surplus and discarded materials, temporary structures, and debris of any kind. He shall leave the site of the work in a neat and orderly condition. Waste materials removed from the site of the work shall be disposed of at locations satisfactory to the Engineer.

1105 CONTROL OF WORK AND MATERIALS

1105.1 *AUTHORITY OF ENGINEER*

All work shall be done under the supervision of the Engineer and to his satisfaction. He shall decide all questions which arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of the plans and specifications, acceptable fulfillment of the contract, compensation mutual rights between contractors under these specifications, and suspension of work. The Engineer shall have the right to establish any sequence or priority of operation in the interest of desirable cooperation with other work. He shall determine the amount and quality of work performed and materials furnished, and his decision and estimates shall be final and binding on the Contractor. His estimate in such event shall be a condition precedent to the right of the Contractor to receive money due him under the contract.

1105.2 *CONFORMITY WITH PLANS, ALLOWABLE DEVIATIONS*

All deviations from the specifications will be accomplished by Change Orders prepared by the Engineer. All Change Orders shall be in writing and shall be reviewed by the City before the work is commenced. Change Orders submitted to the City for review shall bear the signature of the Engineer, and shall be provided hereinafter.

1105.3 *DETAIL SHOP AND WORKING DRAWINGS FURNISHED BY CONTRACTOR*

The Contractor shall submit to the Engineer for review, such additional shop and working drawings of structures or equipment as may be required and, prior to the acceptance of such drawings by the Engineer, any work done or materials ordered shall be at the Contractor's risk. The Contract price shall include the cost of furnishing such drawings.

1105.4 *COORDINATION OF PLANS, SPECIFICATIONS, PROPOSAL AND SPECIAL PROVISIONS*

The plans, these specifications, the Proposal, Special Conditions and all supplementary documents are intended to describe a complete work, and are essential parts of the contract. A requirement occurring in any of them is binding. In case of discrepancies, figured dimensions shall govern over scaled dimensions; Specifications shall govern over Plans; Special Conditions shall govern over General Conditions and the quantities shown in the Proposal shall govern over those shown on the Plans. The Contractor shall take no advantage of any apparent error or omission in the plans and specifications, and the Engineer shall be permitted to make such corrections or interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications. In the event the Contractor discovers any apparent error or discrepancy, he shall immediately call such error or discrepancy to the attention of the Engineer.

1105.5 *COOPERATION OF CONTRACTOR*

- A. Plans and Specifications will be provided to the contractor in electronic format (pdf). **The Contractor, however, shall have plans and specifications available at each work site during the execution of the contract.**
- B. The Contractor shall give to the work the consistent attention necessary to facilitate the program thereof, and he shall cooperate with the Engineer and his inspectors and with other contractors in every way possible. The Contractor shall always provide a competent Superintendent on the work site who is fully authorized as his agent on the work. Such Superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his representative. The Contractor and his Superintendent shall provide all reasonable facilities to enable the Engineer and his inspectors to inspect the workmanship and materials entering into the work.

1105.6 *MEASUREMENTS*

Before ordering any material or doing any work, the Contractor shall verify all measurements involved, and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on the drawings, and any differences which may be found shall be submitted to the Engineer for consideration before proceeding with the work.

1105.7 *SOURCE OF SUPPLY AND QUALITY OF MATERIALS*

The Contractor shall not start delivery of materials until the Engineer has reviewed the source

of supply. Only materials conforming to the requirements of these specifications shall be used in the work, and such materials shall be used only after written acceptance by the Engineer, and only so long as the quality of said material remains equal to the requirements of the specifications. The Contractor shall furnish accepted materials from other sources, if for any reason the product from any source at any time before commencing or during the prosecution of the work proves unacceptable. After acceptance, any material which has become mixed with or coated by dirt or any other foreign substance during its delivery and handling shall not be used in the work.

1105.8 *APPROVAL OF MATERIALS*

Before ordering materials, the Contractor shall make written request to the Engineer for review and acceptance of, the use of any materials, construction, etc., other than those mentioned as standard in the specifications or so indicated on the drawings, and obtain his acceptance of materials, construction, etc., proposed for use when "accepted" materials or work are specified without mentioning any standard by name. The terms "accepted" or "accepted equal" shall mean accepted by the Engineer.

1105.9 *SAMPLES AND TESTS OF MATERIALS*

The Contractor shall submit samples of materials, finish appliances, etc., when required by the Engineer; all such samples must be accepted by the Engineer in writing before work is executed, and all work shall conform in all respects to accepted samples. Work not conforming to accepted samples will be rejected and the Contractor shall remove such nonconforming work and replace it with work that does conform. If submittals are not accepted, others shall be submitted until satisfactory samples have been accepted. Where, in the opinion of the Engineer or called for in the specifications, tests of materials are necessary, the City will pay the cost of all initial testing of which passes the requirements. The Contractor will pay for two (2) passing tests for each failed test. This cost will be deducted from the Contractor's Pay Estimate. The developer of a subdivision which requires public improvements shall pay the cost of all testing. Tests, unless otherwise specified, are to be made in accordance with the latest standard methods of the American Society for Testing Materials. All tests shall be made by a laboratory acceptable to the Engineer and the City. The Contractor shall provide such facilities as may be required for collecting and forwarding samples, and shall not use the materials represented by the samples until tests have been made and reviewed by the Engineer. All field tests shall be made by a representative of an approved testing laboratory. Testing shall be performed as specified in the Special Conditions or Specifications unless otherwise required by the City.

1105.10 *GUARANTY*

Unless otherwise specified in the Special Conditions, the Contractor shall guarantee the work for two (2) years from date to acceptance by Engineer and City. Neither the final certificate, nor payment, nor any provisions in the contract documents, shall relieve him of responsibility for negligence or faulty materials or workmanship within the extent and period provided; and upon written notice from the Engineer or the City, he shall remedy any defects due thereto and pay all expenses for any damages to other work resulting therefrom.

1105.11 *STORAGE OF MATERIALS*

Materials shall be stored so as to insure the preservation of their quality and fitness for the work. When directed by the Engineer, they shall be placed on wooden platforms or other hard, clean surfaces and not on the ground, and shall be placed under cover when directed. Stored materials shall be located so as to facilitate prompt inspection.

1105.12 *INSPECTION*

- A. The Contractor shall ensure the Engineer has the opportunity to ascertain whether or not the work as performed is in accordance with the requirements and intent of the plans and specifications. Ample advanced notice will be provided by the Contractor to the Engineer of the need to cover over any uninspected work by a certain date in order to not delay the project.
- B. If the Engineer requires, the Contractor shall, at any time before acceptance of the work, remove and uncover such portions of the finished work as may be directed for inspection. After inspection, the Contractor shall restore said portion of the work to the condition required by the specifications.
- C. Should the work thus exposed at the direction of the Engineer prove acceptable, the cost of uncovering or removing and the replacing of covering or making good the parts removed will be paid for as "Extra Work. However, if ample notice was not provided by the Contractor to the Engineer of the intent to cover over the work, then the cost of the uncovering or removing and the replacing of the covering or making good of the parts removed shall be borne by the Contractor, regardless of whether or not the work examined proved acceptable or unacceptable. Should the work so exposed or examined prove unacceptable, the cost of covering or removing and the replacing of the covering or making good of the parts removed shall be at the Contractor's expense,. Any work done or materials used without suitable supervision or inspection by the Engineer may be ordered removed and replaced at the Contractor's expense.

1105.13 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

- A. All work which has been rejected or condemned shall be repaired, or if it cannot be satisfactorily repaired it shall be removed and replaced, at the Contractor's expense. Defective materials shall be removed immediately from the site of the work.
- B. Work done without proper inspection or any extra or unclassified work done without written authority and prior to agreement in writing as to prices, will be done at the Contractor's risk and will be considered unauthorized, and, at the option of the Engineer may not be measured and paid for and may be ordered removed at the Contractor's expense.
- C. Upon the failure of the Contractor to satisfactorily repair or to remove and replace, if so directed, any rejected, unauthorized or condemned work and materials immediately after receiving notice from the Engineer, the Engineer shall, after giving written notice to the Contractor, have the authority to cause defective work to be remedied or removed and replaced, or to cause unauthorized work to be removed and to deduct the cost thereof from any compensation due or to become due to the Contractor. If the Engineer and City deem it inexpedient to correct work injured or done not in accordance with the contract, an equitable deduction from the contract price shall be made therefor.

1105.14 FINAL INSPECTION

The Engineer shall make final inspection of all work included in the contract or any portion thereof as soon as practicable after the work is completed and ready for acceptance. If the work is not acceptable to the Engineer at the time of such inspection, he shall inform the Contractor as to the particular defects to be remedied before final acceptance can be made.

1106 LEGAL RELATION AND RESPONSIBILITY TO THE PUBLIC

1106.1 LAWS TO BE OBSERVED

The Contractor shall, at all times, observe and comply with all Federal and State laws and City ordinances and regulations which in any manner affect the conduct of the work and shall observe and comply with all orders and decrees which exist at the present or which may be enacted later, or bodies or tribunals having jurisdiction or authority over the work.

1106.2 CONTRACTOR TO DEFEND, INDEMNIFY, AND SAVE HARMLESS - VIOLATIONS

The Contractor and his Surety shall defend, indemnify, and save harmless the City and all its officers, agents, and employees against any claims or liabilities arising from or based on the violation of any such law, ordinance, regulation, order, or decree whether by himself or his employees.

1106.3 PERMITS AND LICENSES

The Contractor shall procure all permits and licenses, pay all charges or fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. The expense of all permits required by the City shall be paid by the City.

1106.4 PATENTED DEVICES, MATERIALS AND PROCESSES

If the Contractor is required or desires to use any design, device, material or process covered by letters, patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or City. It is mutually understood and agreed that without exception the contract prices shall include all royalties or costs arising from patents, trademarks and rights-of-way involved in the work.

1106.5 SANITARY PROVISIONS

The Contractor shall establish and enforce among his employees such regulations in regard to cleanliness and the disposal of garbage and waste as will tend to prevent the inception and spread of contagious or infectious diseases and to effectively prevent the creation of a nuisance about the work or any property, either public or private. The necessary sanitary conveniences for the use of laborers on the work properly secluded from public observation shall be constructed and maintained by the Contractor, and their use shall be strictly enforced by the Contractor. All sanitary laws and regulations of the City and of the State of Oklahoma shall be strictly complied with.

1106.6 PUBLIC CONVENIENCE AND SAFETY

- A. Materials stored about the work shall be so placed, and the work shall at all times be so conducted to provide for public safety and convenience, and to cause no greater inconvenience for the traveling public than is considered necessary by the Engineer. A work zone traffic control plan shall be provided and accepted by the City Engineer prior to commencing any work. The Contractor shall make provisions, bridges or otherwise at all cross streets, highways, sidewalks and private driveways, for the free passage of vehicles and pedestrians, provided that where bridging is impracticable or unnecessary in the opinion of the Engineer, the Contractor may make arrangements satisfactory to the Engineer and City for the diversion of traffic; and shall, at

his own expense, provide all materials and perform all work necessary for the construction and maintenance of roadways and bridges for the diversion of traffic. Sidewalks must not be obstructed unless by special permission of the Engineer, subject to review by the City.

- B. Neither the materials excavated nor the construction materials excavated nor the construction materials or plant used in the construction of the work, shall be placed so as to endanger the work or prevent free access to all fire hydrants, water valves, gas valves, manholes for electric, telephone, telegraph or traffic signal conduits, sewers or fire alarm or police call boxes in the vicinity. The City reserves the right to remedy any neglect on the part of its attention after twenty-four (24) hours notice in writing to the Contractor, save in cases of emergency, when it shall have the right to remedy any neglect without notice; and in either case, the cost of such work done by the City shall be deducted from monies due or to become due the Contractor.
- C. When the Contractor is required to construct temporary culverts or bridges, or make other arrangements for crossing over ditches or streams, his responsibility for accidents shall include the roadway approaches as well as the structures of such crossings.

1106.7 PRIVILEGES OF CONTRACTOR IN STREETS, ALLEYS OR RIGHTS-OF-WAY

For the performance of the Contract, the Contractor will be permitted to occupy such portions of streets or alleys, other public places or other rights-of-way as provided for in the ordinances of the City, as shown on the plans, or as permitted by the Engineer. A reasonable amount of tools, materials and equipment for construction may be stored in such space, but not more than is necessary to avoid delay in the construction. Excavated and waste materials shall be piled or stacked in such a way as not to interfere with spaces that may be designated to be left free and unobstructed, nor inconvenience occupants of adjoining property. Any additional grounds desired by the Contractor for his use shall be provided at his own expense.

1106.8 PROTECTION OF PROPERTY

The Contractor shall protect the work and adjacent property from damage resulting from carelessness or other causes or by reason of the action of the elements until the entire work is completed and accepted. The work shall be entirely at the Contractor's risk, and the City assumes no responsibility whatever for damage or loss to any of the work or adjacent property by reason of the Contractor's judgment.

1106.9 CONTRACTOR'S CLAIM FOR DAMAGES

Should the Contractor claim compensation for any alleged damage by reason of the acts or omissions of the City, he shall within ten (10) days after the sustaining of such damage, make a written statement to the Engineer setting out in detail the nature of the alleged damage. On or before the twenty-fifth (25th) day of the month succeeding that in which any such damage is claimed to have been sustained, the Contractor shall file with the Engineer an itemized statement of the details and amount of such damage, and upon request shall give the Engineer access to all books of account, receipts, vouchers, bills of lading and other books or papers containing any evidence as to the amount of such damage. Unless such statement shall be filed as thus required, the Contractor's claim for compensation shall be waived, and he shall not be entitled to payment on account of any such damage.

1106.10 PUBLIC UTILITIES AND PUBLIC PROPERTY TO BE CHANGED

In case it is necessary to change or move the property of any owner of a public utility, such owner will, upon proper application by the Contractor, be notified by the Engineer to change or move such property within a specified time, and the Contractor shall not interfere with such property until ordered to do so by the Engineer. The right is reserved to the owner of public utilities to enter upon the limits of the Contract for the purpose of making such repairs or changes of their property that may be necessary by performance of the Contract for the purpose of repairing or relaying sewer and water lines and appurtenances, repairing culverts or storm drains, and for making other repairs, changes, or extensions to any City property.

1106.11 DELAYS AND EXTENSIONS OF TIME

- A. If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the City or the Engineer, or by any employee of either, or by any separate contractor employed by the City, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably anticipatable, unavoidable casualties, or any causes beyond the Contractor's control, or by delay authorized by the City pending arbitration, or by any other cause which the Engineer determines may justify the delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Engineer may determine.
- B. Any claim for extension of time shall be made in writing to the Engineer not more than twenty (20) days after the commencement of the delay, otherwise it shall be waived. In the case of continuing delay only one claim is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work.

1106.12 USE OF FIRE HYDRANTS

The Contractor or his employees shall not open, turn off, interfere with, attach pipe or hose to or connect anything with any fire hydrant, stop valve or stop cock, or tap any water main belonging to the City, unless duly authorized to do so by the City.

1106.13 USE OF A SECTION OR PORTION OF THE WORK

Whenever, in the opinion of the Engineer, any portion of the work or any structure is in suitable condition, it may be put into use by the written order of the Engineer, and such usage shall not be held to be in any way an acceptance of said work or structure or any part thereof, or as a waiver of any of the provisions of these specifications or contract. Pending final completion and acceptance of the work, all necessary repairs and renewals on any section of the work so put into use, due to defective materials or workmanship, to natural causes other than ordinary wear and tear, or to the operations of the Contractor, shall be performed by and at the expense of the Contractor.

1106.14 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

Until written acceptance by the Engineer as provided for in these specifications, the work shall be under the charge and care of the Contractor, and he shall take every necessary precaution to prevent injury or damage to the work or any part thereof by the action of the elements or from any other of the cause whatsoever, whether arising from the execution or from the nonexecution of the work. The Contractor shall rebuild, repair, restore and make good at his own expense all injuries or damage to any portion of the work occasioned by any of the above causes before acceptance.

1106.15 *PERSONAL RESPONSIBILITY OF PUBLIC OFFICIALS*

In carrying out any of the provisions contained herein or in exercising any power or authority granted to him by the Contract, there shall be no liability upon the Engineer or his authorized assistants, either personal or as officials of the City, it being understood that in such matters he acts as the agent and representative of the City.

1106.16 *WAIVER OF LEGAL RIGHTS*

Inspection by the Engineer or by any of his duly-authorized representatives, any order, measurement or certificate by the Engineer, any order by City for the payment of money, any payment for or acceptance of any work, or any extension of time or any possession taken by the City, shall not operate as a waiver of any provisions of the contract or any power therein provided. Any waiver of any breach of contract shall not be held to be a waiver of any other or subsequent breach. The City reserves the right to correct any error that may be discovered in any estimate that may have been paid and to adjust the same to meet the requirements of the contract and specifications. The City reserves the right to claim and recover by process of law sums as may be sufficient to correct any error or errors, or make good any deficiency in the work resulting from such error or deficiency, dishonesty or collusion discovered in the work after the final payment has been made.

1106.17 *CONTRACTOR'S INDEMNIFICATION*

- A. The Contractor shall not commence work under this contract until he has obtained all insurance required under this specification, and such insurance has been reviewed by the City, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and accepted.
- B. The Contractor shall indemnify and hold harmless the City and the Engineer and their agents and employees from and against all claims, damages, losses and expenses; including attorney's fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom; and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.
- C. In any and all claims against the City or the Engineer or any of their agents or employees, by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under Workmen's Compensation acts, disability benefit acts, or any other employee benefit acts.
- D. The obligation of the Contractor shall not extend to the liability of the Engineer, his agents or employees, arising out of (1) the preparation of approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications; or (2) giving of or the failure to give directions of instructions by the Engineer, his agents or employees, provided such giving or failure to give is the primary cause of the injury or damage.

1106.18**INSURANCE**

- A. The Contractor shall not commence work under this contract until he has obtained all insurance required under this Specification and such insurance has been reviewed and accepted by the City, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and reviewed. The limits of liability under this section shall provide coverage for not less than the following amounts or greater where required by law.
1. ***Compensation and Death Liability Insurance*** The Contractor shall furnish and maintain during the life of this Contract, Workmen's Compensation Insurance as prescribed by the laws of the State of Oklahoma and Employer's Death Liability Insurance in an amount not less than one hundred thousand (\$100,000) Dollars for all his employees employed at the site of the project, and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation and Employer's Death Liability Insurance for all the latter's employees, unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work, work under this Contract at the site of the project which is not protected under the insurance heretofore mentioned, the Contractor shall provide, and shall cause each subcontractor to provide adequate insurance for the protection of his employees not otherwise protected.
 2. **Public Liability and Property Damage Insurance**
 - (a) **Contractor's Insurance.** The Contractor and/or Subcontractor shall maintain during the life of this contract such Public Liability and Property Damage Insurance as will protect him from claims for damages for bodily injury, including accidental death, as well as from claims from property damages which may arise from operations under this contract whether such operations by himself or by his subcontractor or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:
 - (1) **Bodily Injury Liability** in the amount of not less than \$100,000.00 for injuries including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than \$300,000.00 for one accident.
 - (2) **Property Damage Liability Limits** shall be carried in the amounts of not less than \$100,000.00 for any one accident and an aggregate limit of \$100,000.
 - (b) **Owner's Insurance.** Contractor shall provide Owner's Protective Liability Insurance with this City as the name insured, and the engineers as additional insured, to protect the City and engineers against claims arising out of operations of Contractors and other independent Contractors,

as well as omissions of supervisory acts of the City and engineers in connection with the performance of the contract covered by these specifications in the following minimum amounts.

- (1) Bodily Injury Liability in the amount of not less than \$1,000,000 for injuries including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than \$2,000,000. for one accident.
 - (2) Property Damage Liability shall be carried in the amounts of not less than \$100,000.00 for any one accident and an aggregate limit of \$100,000.00.
- (c) Comprehensive General Liability Insurance. The Contractor shall procure and maintain during the life of this Project Comprehensive General Liability Insurance to protect from claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees, including claims insured by personal injury during liability coverage and from claims for injury or destruction of tangible property, including loss of use resulting therefrom, any and all of which may arise out of or as a result from the Contractor's operations under the Contract, whether such operations be by himself or by any Sub-Contractor or anyone directly or indirectly employed by any of them, or for whose acts any of them may be legally liable. Such insurance shall include coverage for:
- (1) Operation and Premises
 - (2) Independent Contractor Protective Liability
 - (3) Contractual Liability
 - (4) Explosion, Collapse, or Underground Damage
- (d) Liability Limits. The limits of Liability for property damage, including accidental death, shall be \$2,000,000.00 per occurrence and a total limit of \$2,000,000.00 for all Completed Operations - Products bodily injury claims during a single policy year. The limits of liability for property damage shall be \$2,000,000.00 per occurrence and \$2,000,000.00 aggregate limit individually each for operations, Independent Contractor Protective, and Contractual for each project, and \$2,000,000.00 aggregate limit for Completed Operation - Product damage during a single policy year.
- (e) Comprehensive Automobile Liability. This insurance shall cover owned, hired, or other non-owned automobiles and shall protect the contractor from claims for bodily injury or property damage which may arise from the use of motor vehicles engaged in various operations under this Contract. The automobile insurance shall provide minimum limits of

liability for bodily injury of \$1,000,000 for each person and \$2,000,000 each occurrence, and \$500,000 of property damage each occurrence

- B. The policies of insurance shall be executed by an insurance or indemnity carrier authorized to do business in the State of Oklahoma.
- C. Before awarding a contract, the City will be furnished a binder or certificate of insurance showing the coverage to be in effect.

1106.19 LIENS

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the City a complete release of all liens arising out of this contract, or receipts in full in lieu thereof, and if required in either case an affidavit that so far as he has knowledge or information, the releases and receipts include all the labor and material for which a lien could be filed; both the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the City to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the City all monies that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

1106.20 TRANSPORTATION TAX

- A. Under provisions of Section 3475 (b) of the Internal Revenue Code, as amended, the State of Oklahoma, its agencies and political subdivisions are exempt from payment of the three per centum (3%) transportation tax levied by Subsection (a) of Section 3475, in either of the following cases:
 - 1. When the property (equipment, goods, materials, etc.) is consigned to the State, its agencies, or political subdivisions, or,
 - 2. When such property is consigned to the State, its agency, or political subdivision in care of the Contractor.
- B. It is the policy of the City to take advantage of the savings afforded by the above mentioned exemption. To this end, the Contractor agrees to comply with the following:
 - 1. "In determining cost of material and computing freight charges, do not include a 3% Federal Transportation of Property Tax. Section 3475 (b) of the Internal Revenue Code, as amended, exempts the City from this tax. The successful Bidder will be furnished an appropriate exemption certificate form by the contracting authority, and will be authorized to have all shipments of construction materials and equipment entering into this Contract consigned to the City in care of himself, thereby enabling him to take advantage of the above- mentioned exemption."

NOTE: Said exemption will not apply to shipments of fuel, lubricants, spare parts, or items of construction equipment belonging to the Contractor which will not become the property of the City.

1106.21 CONSTRUCTION AND MAINTENANCE SIGNING

- A. Work Zone Traffic Control Plan (WZTCP) shall be prepared and submitted. The WZTCP shall show devices and shall reflect the contractor's plan of work on the project. Installation and removal times of devices shall be

provided. The WZTCP shall include any sidewalks that are inside the work area. The plan shall include barricades and detours for sidewalk closures. Submittal of a traffic control plan shall not be considered notice of closure of a roadway.

- B. Signing shall be in accordance with Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations of the current *Manual on Uniform Traffic Control Devices* (MUTCD). The Contractor shall, at his own expense, design, provide, and maintain the appropriate traffic control devices, to be reviewed by Norman's City Traffic Engineer prior to signing. Maintenance shall mean that the contractor shall check the traffic control devices daily (Including holidays, Saturdays, Sundays and days the contractor is not actively working on the project) to ensure they are properly installed and in proper working order.
- C. The Contractor must have a certified Workzone Traffic Technician (WTT) responsible for the installation and maintenance of all traffic control devices required by latest revision of the (MUTCD) for the protection of traffic in and around the construction work sites. The WTT may be an employee of the Contractor or the Contractor may hire an outside firm to perform this service.
- D. The WTT must be certified by a recognized public agency such as the Oklahoma Department of Transportation, OSU Technical Institute, American Traffic Safety Services Association, etc.
- E. Sandbags shall be used for ballasting portable signs and barricades. Sandbags shall be placed on the lower parts of the frame. Application and number of sandbags shall be sufficient to withstand the force of wind gusts on the traffic control device.
- F. The Contractor shall provide the Traffic Control Division and the City Engineer or designed with 72 hours notice prior to the closure of any roadway. Each separate closure requires a separate notice which includes specific dates, times and durations. The notice shall also include a traffic Control Plan as described above, which has been approved 72 hours prior to the road closure.
- G. The Contractor shall either furnish watchmen at the point of closure to protect any freshly installed pavement or install impenetrable barriers at the points of closures. The Contractor will be held responsible for all damage to the work due to failure of barricades, signs, lights, and watchmen to protect it, and whenever evidence of such damage is found prior to acceptance, the City may order the damaged portion immediately removed and replaced by the Contractor at his expense, if, in the opinion of the Superintendent such action is justified. The Contractor's responsibility for the maintenance of barricades, sign, and lights and for providing watchmen shall not cease until the project shall have been accepted by the City.
- H. Where traffic control signs, devices, flagmen, etc., are required by law in conjunction with this work through other utility, railroad, or Governmental Agencies, all necessary traffic control shall be provided by and at the expense of the Contractor to the extent as affected by this project.

1106.22

PROTECTION AND RESTORATION OF PROPERTY

- A. The Contractor shall not enter upon private property, whether the property has an easement or not, for any purpose without first giving twenty-four (24) hour

advance notice to property owner, and shall use reasonable caution necessary to prevent damage to landscaping, fences, culverts, bridges, pavements, driveways, sidewalks, etc., to all water, sewer, gas or electric lines or appurtenances thereof, and to all other public or private property along or adjacent to the work. The Contractor shall notify the proper representatives of any public service corporation, any company or individual, not less than twenty-four (24) hours in advance of any work which might damage or interfere with the operation of their or his property, along or adjacent to the work.

- B. Contractor shall be responsible for all damage or injury to property of any character resulting from any neglect or misconduct in the manner or method of executing the work or materials, and said responsibility shall not be released until the work shall have been completed and accepted. When and where any direct or indirect damage or injury is done to public or private property on account of any neglect or misconduct in the execution of the work in consequence of the nonexecution thereof on the part of the Contractor, he shall repair at his expense such damage to a condition similar or equal to that existing before such damage or injury was done; by repairing, rebuilding or otherwise.
- C. In case of the failure on the part of the Contractor to repair such damage or make good such damage or injury, the Engineer may, upon forty-eight (48) hours written notice, under ordinary circumstances and without notice when a nuisance or hazardous condition results, proceed to repair, rebuild or otherwise restore such property as may be determined necessary, and the cost thereof will be deducted from any monies due or to become due the Contractor under his contract.

1106.23 *PROTECTION AND PRESERVATION OF LAND MONUMENTS AND PROPERTY LINE MARKS*

The Contractor shall protect carefully from disturbances or damages all land monuments and iron pins or other markers which establish property or street lines, provided that where such monuments or markers must, of necessity, be disturbed or removed in the performance of the Contract, the Contractor shall first give ample notice to the City, so that he may witness or reference in such monuments or markers. Should the Contractor disturb, remove, or damage any established land monument or property or street line mark without first giving the City ample notice, the City may deduct the cost of re-establishing such monument or marks from any monies due or to become due the Contractor.

1107 PROSECUTION AND PROGRESS

1107.1 *SUBLETTING OF WORK*

- A. The Contractor shall not employ any subcontractor on the work without prior written acceptance of the Engineer and the City.
- B. Subcontractors proposed for any part of the work and all subcontractors must be accepted by the City in writing within thirty (30) days after the award of the contract.
- C. The City will not recognize any subcontractor on the work. The Contractor shall at all times when work is in operation be represented either in person or by a qualified superintendent or other designated representative. If the Contractor sublets the whole or any part of the work to be done under this

contract, he will not under any circumstances be relieved of his responsibility and obligations. The Contractor shall not subcontract more than 40% after excluding the cost of all materials without written permission of the City of Norman. Failure to comply with this provision will constitute breach of Contract, and the City shall take appropriate action to dismiss the Contractor. In this event, the Contractor will have no claims (such as lost profit, etc.), due to his breach of this provision. All transactions of the Engineer shall be with the Contractor. Subcontractors will be considered only in the capacity of the employees or workmen and shall be subject to the same requirements as to character and competency.

1107.2 *ASSIGNMENT OF CONTRACT*

The Contractor shall not assign, transfer, convey, or otherwise dispose of the Contract or his right, title, or interest in or to the same or any part thereof, without the previous consent of the Engineer in writing, accepted by the City Council, and concurred in by the Surety. If the Contractor does without such previous consent, assign, transfer, convey, sublet, or otherwise dispose of the Contract or his right, title, or interest therein, or any part thereof, to any person or persons, partnership, firm or corporation, or by bankruptcy, voluntary or involuntary, or by assignment under the insolvency laws of any state, attempt to dispose of the Contract or make default in or abandon said Contract, then the Contract may, at the option of the City, be revoked and annulled unless the Surety shall successfully complete said Contract and any monies due or to become due under said Contract shall be retained by the City as liquidated damages for the reason that it would be impracticable and extremely difficult to fix the actual damages.

1107.3 *PROSECUTION OF WORK*

The Contractor shall begin the work to be performed under the contract within the time limit stated in the Advertisement, Proposal and Contract, and shall conduct the work in such a manner and with sufficient equipment, materials and labor as necessary to insure its completion within the time limit set forth in the Advertisement, Proposal and Contract. The sequence of all construction operations shall at all times be as directed by the Engineer. Should the prosecution of the work for any reason be discontinued by the Contractor, he shall notify the Engineer at least twenty-four (24) hours in advance of resuming operations.

1107.4 *LIMITATION OF OPERATIONS*

The Contractor shall conduct his work so as to create a minimum amount of inconvenience to the public. At any time when the Contractor, in the judgment of the Engineer, has obstructed or closed or is carrying on operations on a greater portion of the street or public way than is necessary for the proper execution of the work, the Engineer may require the Contractor to finish the section on which work is in progress before work is started on any additional section.

1107.5 *CHARACTER OF WORKMEN AND EQUIPMENT*

- A. The Contractor shall employ such superintendents, foremen and workmen as are careful and competent, and the Engineer may demand the dismissal of any person or persons employed by the Contractor in, about or on the work who shall misconduct himself or be incompetent or negligent in the proper performance of his or their duties, or neglect or refuse to comply with the directions of the Engineer, and such person or persons shall not be employed again thereon without the written consent of the Engineer. Should the Contractor continue to employ or again employ such person or persons without the written consent of the Engineer, then the Engineer may withhold

all estimates which are, or may become due, or may suspend the work, until compliance with such orders is accomplished.

- B. All workmen shall have sufficient skill and experience to properly perform the work assigned them. All workmen engaged on special work or skilled work, or in any trade, shall have sufficient experience in such work to properly and satisfactorily perform it and operate the equipment involved, and shall make due and proper effort to execute the work in the manner prescribed in these Specifications; otherwise, the Engineer may take action as above prescribed.
- C. The Contractor shall furnish such equipment as is considered necessary for the prosecution of the work in an acceptable manner and at a satisfactory rate of progress. All equipment, tools and machinery used for handling materials and executing any part of the work shall be subject to review by the Engineer, and shall be maintained in a satisfactory working condition. Equipment on any portion of the work shall be such that no injury to the work or adjacent property will result from its use. Equipment shall meet applicable safety and environmental standards.

1107.6 DAY'S WORK: WORKING HOURS

Work shall be done only during regular and commonly accepted and prescribed working hours. No work shall be done nights, Saturdays, Sundays or regular holidays unless a special order or permit is given by the Engineer to do so. Eight (8) hours shall constitute a days work, and the Contractor shall observe all State Laws and City Ordinances governing the hours of work.

1107.7 TIME OF COMMENCEMENT AND COMPLETION

The Contractor shall commence work within the time specified in the Contract and the rate of progress shall be such that the whole work will be performed and the premises cleaned up in accordance with the Contract, Plans, and Specifications within the time limit, where such time is stated in the Contract, unless an extension of time be made in the manner hereinafter specified.

1107.8 EXTENSION OF TIME OF COMPLETION

The Contractor shall be entitled to an extension of time, as provided herein only when claim for such extension is submitted to the Engineer in writing by the Contractor within seven (7) days from and after the time when any alleged cause of delay shall occur and then only when such claim is accepted by the Engineer and the City Council. In adjusting the Contract time for the completion of the project, all strikes, lockouts, unusual delays in transportation, or any condition over which the Contractor has no control, unusual adverse weather conditions above normal for the contract period, and also any suspensions ordered by the Engineer for causes not the fault of the Contractor, shall be excluded from the computation of the Contract time for completion of the work. If the satisfactory execution and completion of the Contract should require work or materials in greater amounts or quantities than those set forth in the Contract, then the Contract time shall automatically be increased in the same proportion as the cost of the additional work relates to the cost of the original contracted work. No allowance shall be made for delays or suspension of the prosecution of the work due to the fault of the Contractor.

1107.9 FAILURE TO COMPLETE WORK ON TIME

- A. The time of completion is of the essence of the Contract. For each calendar day that any work shall remain uncompleted after the time agreed upon in the Proposal and the Contract, or as automatically increased by additional

work or materials ordered after the Contract is signed, or the increased time granted by the City for the completion of said work, the sum per day given in **APPENDIX D Fee Schedule** of the Engineering Design Criteria Manual, unless otherwise specified in the Proposal or Special Conditions, will be deducted from the monies due the Contractor, not as a penalty but as liquidated damages.

1107.10 TEMPORARY SUSPENSIONS

- A. The Engineer shall have the authority to suspend the work, wholly or in part, for such period or periods as he may deem necessary due to unsuitable weather or such other conditions as are considered unfavorable for the suitable prosecution of the work.
- B. If it should become necessary to stop work for an indefinite period, the Contractor shall store all materials in such manner that they will not obstruct or impede the traveling public unnecessarily, nor become damaged in any way, and he shall take every precaution to prevent damage or deterioration of the work performed, and shall provide suitable drainage about the work and erect temporary structures where necessary.
- C. The Contractor shall not suspend work without written authority from the Engineer, and shall proceed with the work promptly when notified by the Engineer to resume operations.

1107.11 SUSPENSION OF WORK AND ANNULMENT OF CONTRACT

- A. The work or any portion of the work under contract shall be suspended immediately on written order of the Engineer or the City, a copy of such notice to be served upon the Contractor's Surety, or the contract may be annulled by the City for any good cause or causes, among others of which special reference is made to the following:
 - 1. Failure of the Contractor to start work within the time limit specified.
 - 2. Substantial evidence that the progress being made by the Contractor is insufficient to complete the work within the specified time.
 - 3. Failure of the Contractor to provide sufficient and proper equipment for properly executing the work.
 - 4. Deliberate failure on the part of the Contractor to observe any requirements of these specifications, or to comply with any orders given by the Engineer, as provided for in these specifications.
 - 5. Failure of the Contractor to promptly make good any defects in materials or workmanship or any other nature, the correction of which has been directed in writing by the Engineer.
 - 6. Substantial evidence of collusion for the purpose of illegally procuring a contractor perpetrating fraud on the City in the construction of work under contract.
- B. When work is suspended for any one of the causes itemized above, or for any other cause or causes, the Contractor shall discontinue the work or any part thereof as the City shall designate, whereupon the Surety may at its option

assume the contract or that portion thereof which the City has ordered the Contractor to discontinue, and may perform the same; or may, with the written consent of the Engineer, accepted by the City, sublet the work or portion of the work so taken over; provided, however, that the Surety shall exercise its option (if at all) within two (2) weeks after the written notice to discontinue work has been served upon the Contractor and upon the Surety or its authorized agent. The surety, in such event, shall assume the Contractor's place in all respects and shall be paid by the City for all work performed by it in accordance with the terms of the contract; and if the Surety, under the provisions hereof, shall assume said entire contract, all monies remaining due the Contractor at the time of his default, shall thereupon become due and payable to the Surety as the work progresses, subject to all the terms of the contract.

- C. In the event the Surety does not, within the time hereinbefore specified, exercise its rights and option to assume the contract or that portion thereof which the City has ordered the Contractor to discontinue then the City shall have the power to complete, by contract or otherwise as it may determine, the work herein described or such part thereof as it may deem necessary, and the Contractor hereby agrees that the City shall have the right to take possession of and use any of the materials, plant, tools, equipment, supplies and property of every kind provided by the Contractor for the purpose of his work, and to procure other tools, equipment and materials for the completion of the same, and to charge to the account of the Contractor the expenses of said contract for labor, materials, tools, equipment and expenses incident thereto. The expense so charged shall be deducted by the City out of such monies as may be due or may at anytime thereafter become due the Contractor under any by virtue of the contract or any part thereof. The City shall not be required to obtain the lowest bid for the work of completing the contract, but the expense to be deducted shall be the actual cost of the work. In case such expense is less than the sum which would have been payable under the contract if the same had been completed by the Contractor, the balance shall operate at liquidated damages as hereinabove set out. In case such expense shall exceed the amount which would have been payable under the contract if the same had been completed by the Contractor, then the Contractor and his Surety shall pay the amount of such excess to the City on notice from the City of the excess so due. When any particular part of the work is being carried on by the City by contract or otherwise under the provisions of this section, the Contractor shall continue the remainder of the work in conformity with the terms of the contract, and in such manner as in no wise to hinder or interfere with the performance of workman employed as above provided by the City.

1107.12 *TERMINATION OF CONTRACT*

The contract will be considered fulfilled, save as provided in any bond or bonds or by law, when all the work has been completed, the final inspection made by Engineer, and final acceptance and final payment made by the City.

1108 *MEASUREMENT AND PAYMENT*

1108.1 *MEASUREMENT OF QUANTITIES*

The determination of quantities of work acceptably completed under the terms of the contract, or as directed by the Engineer, in writing, will be made by the Engineer, based on measurements taken by him or his assistants. These measurements of quantities will be taken according to the

plan units. When materials are measured in the vehicle, the measurement will be taken at the point of delivery. When required by the Engineer, the capacity of all vehicles shall be plainly marked on each vehicle, and the capacity or marking shall not be changed without the permission of the Engineer.

1108.2 APPLICATION FOR PROGRESS PAYMENT

- A. At least twenty days before each progress payment is scheduled (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. Application must be submitted on the form provided herein. Payment may be delayed or not processed without use of the proper application form. Non-standard forms not provided by the City may be rejected at City's Discretion. It shall be the Contractor's responsibility to make copies for his use from the form provided herein. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that City has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect City's interest therein, all of which will be satisfactory to City. The amount of retainage with respect to progress payments will be as stipulated herein.
- B. **Contractor's Warranty of Title:** Contractor warrants and guarantees that title to all work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to City no later than the time of payment free and clear of all liens.
- C. **Review of Applications for Progress Payment:** Engineer will, within ten (10) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to City, or return the Application to the Contractor, indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application for payment at a later date.

1108.3 SCOPE OF PAYMENT

- A. The Contractor shall receive and accept the compensation as herein provided in full payment for furnishing all labor, materials, tools, equipment, and incidentals; for performing all work contemplated and embraced under the Contract; for all loss of damage arising out of the nature of the work or from the action of the elements; for any unforeseen defects or obstruction which may arise or be encountered during the prosecution of the work and before its final acceptance by the Engineer; for all risks of every description connected with the prosecution of the work; for all expenses incurred by or in consequence of suspension or discontinuance of such prosecution of the work as herein specified; for any infringement of patents, trademarks, or copyrights and for completing the work in an acceptable manner according to the Specifications.

- B. The payment of any current or partial estimate prior to final acceptance of the work by the City shall in no way constitute an acknowledgment of the acceptance of the work, nor in any way prejudice or affect the obligation of the Contractor to repair, correct, renew, or replace at his expense any defects or imperfections in the construction or in the strength or quality of the material used in or about the constructions due to or attributable to such defects, which defects, imperfections, or damage shall have been discovered on or before the final inspection and acceptance of the work. The Engineer shall be the sole judge of such defects, imperfections, or damage and the Contractor shall be liable to the City for failure to correct the same as provided herein.

1108.4

PAYMENT FOR EXTRA WORK

- A. The extra work completed by the Contractor as authorized and accepted by the Engineer and the City Council, will be paid for in the manner hereinafter described and the compensation thus provided shall be accepted by the Contractor as payment in full for all labor, materials, tools, equipment, and incidentals, and all superintendents' and timekeeper's services, all insurance, and all other overhead expense incurred in the prosecution of the extra work.
- B. Payments for extra work will be made by one or more of the following methods:
1. Unit prices agreed on in writing by the Engineer and the Contractor and accepted by the City Council before said work is commenced, subject to all other conditions of the Contract. (For Contracts over \$1,000,000, the maximum amount will be 10%.)
 2. A lump sum price agreed on in writing by the Engineer and the Contractor and accepted by the City Council before said work is commenced, subject to all other conditions of the Contract.
 3. The actual costs including labor, materials, tools, equipment, and field supervision of such extra work plus fifteen percent (15%), which fifteen percent (15%) is hereby understood and agreed to include all overhead expense and profits, when agreed upon in writing by the Engineer and the Contractor, and accepted by the City Council before said work is commenced; subject to all other conditions of the Contract. For Contracts in excess of \$1,000,000, overhead expense and profit is limited to 10%.
- C. The Contractor shall, on or before the tenth (10) day of the month succeeding that in which any extra work shall have been performed, file with the Engineer his claim and an account giving the itemized cost of such work and shall give the Engineer access to all accounts, bills, and vouchers relating thereto. If the estimate exceeds one hundred dollars (\$100) in amount, ninety percent (90%) of such estimated sum will be paid if approved.

1108.5 *PARTIAL ESTIMATES*

Between the 25th day and the last day of each month, the Engineer will make an approximate estimate of the value of the work done and/or materials furnished during that month under these Specifications. Whenever the said estimate or estimates of work done and/or materials furnished since the last previous estimate exceed One Hundred Dollars (\$100) in amount, less retainage of such estimated sum will be paid when accepted.

1108.6 *PAYMENTS WITHHELD*

Should any defective work or material be discovered, or should a reasonable doubt arise as to the integrity of any part of the work completed prior to the final acceptance and payment, there will be deducted from the first estimate rendered after the discovery of such work an amount equal in value to the defective or questioned work and this work will not be included in the subsequent estimate until the defects have been remedied or the cause for doubt removed.

1108.7 *ACCEPTANCE AND FINAL PAYMENT*

Upon completion of any Contract and before final acceptance, a final inspection must be made by the Engineer to determine whether the work has been completed in accordance with the Contract and Specifications. All prior partial estimates and payments shall be subject to correction in the final estimate and payment. When the work has been so completed and certified to the Council, the work will be considered accepted and the final acceptance shall be executed and submitted.

END OF SECTION 1100

City of Norman
STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

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City of Norman
STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 2100 **SITE DEVELOPMENT AND EARTHWORK**

2101 SITE CLEARING AND RESTORING

2101.1 DESCRIPTION

This work shall consist of the removal and reconstruction or replacement of all obstructions (Obstructions include, but are not limited to trees, brush, fences, retaining walls, patios, trash burners, signs, mail boxes, outbuildings, landscaping, etc.) affected by the construction of the project, with the exception of sidewalk, curb, street, parking lot, road, alley surfacing, gravel and oiled surfaces which will be removed and repaired under Section for Pavement Cut and Repair. Any obstructions which are not to be reconstructed are so designated on the plans.

2101.2 MATERIALS

- A. Waste Material: All waste material and debris resulting from the cleaning operation or occurring within the right-of-way shall be disposed of in such a manner that air pollution regulations and solid waste disposal regulations are not violated and private or public property is not injured or endangered. Permission in writing from the property owner must be obtained by the contractor if waste material is placed on private property. A copy of this permission shall be furnished to the Engineer before the final estimate will be paid. In no case will debris or extra material be left in the right-of-way.
- B. Plant Material to be Replaced: Shrubs or trees in the right-of way that are to be replaced will be replaced with like type shrubs or trees. When these items are encountered they shall be removed, preserved, replaced or the contractor may make arrangements with the property owner to replace them. Arrangements with property owners shall be in writing and the Engineer shall be furnished a copy prior to payment of the final estimate.
- C. Salvaged Material: Material such as bricks, signs, manhole frames and covers, etc., which may, in the opinion of the Engineer be suitable for use by the City shall be the property of the City, and shall be neatly stacked or removed to such places along the site of the work as the Engineer may direct. This will be done at no additional cost to the City.

2101.3 CONSTRUCTION METHODS

- A. **General:** The contractor shall clear and remove from the construction site all trees marked for removal, brush, roots, stumps, hedges, fences, rock, rubbish, and any other objectionable materials within or over-hanging the right of way as directed by the Engineer.
- B. **Clearing:**
 - 1. Tree Removal/Protection: No trees shall be removed, even though listed for removal until specifically marked by the Engineer. Trees to be removed shall be felled in such a manner as not to injure other trees which are to remain, either on the right-of-way or adjacent thereto. Trees or plants which are to remain in place and which may be in danger of injury by construction operations or equipment shall be suitably boxed, fenced or otherwise protected. Boxing and fencing shall be constructed and removed at the direction of the Engineer. The contractor shall

repair all injuries to bark, trunk limbs, and roots of remaining trees and shrubs by proper dressing, cutting and painting according to accepted methods, using only accepted tools and materials.

2. **Obstruction Removal:** All obstructions in the designated right-of- way shall be removed and disposed of by the Contractor in a method that is suitable for the obstruction.
 - C. **Maintaining Access:** Passable surfaces across or along the construction site shall be maintained at all times with gravel, steel mat or plate, or temporary bituminous surfacing material where a sidewalk, driveway, parking lot, street, road, or alley previously existed.
 - D. **Maintaining Streets:** The contractor will be responsible for preventing his trucks from scattering debris, mud, and/or soil on public roads. If this occurs the contractor will clean-up debris as required by the Engineer.
 - E. **Reconstruction:**
 1. *General:* All obstructions to be replaced or reconstructed shall be restored to substantially the same condition as existed prior to the construction. The contractor shall remove and dispose of all debris, restore the surface of the earth to the grade existing prior to construction and upon completion of the work shall leave the site in a neat clean and orderly condition, as nearly as it was prior to construction as may reasonably be done.
 2. *Sodding:* When the area being worked crosses the front or side yard of an existing residence or commercial establishment, the disturbed area will be sodded upon completion of other restoration activities. When sodding is required in backyards it will be called for on the plans.
 3. *Seeding:* This will include seeding all disturbed areas with grass and establishing an initial growth on the seeded areas. During the normal growing season the areas will be seeded with grasses that match the surrounding grasses. During the winter months either rye or winter wheat will be used to establish ground cover.

2101.4

SPECIAL REQUIREMENTS

- A. **Notification of Landowners:**
 1. *Privately Held Land:* It shall be the contractor's responsibility to notify all landowners prior to entering onto their property. If an owner has an obstruction that will be affected, they will be notified sufficiently in advance of construction operations so that they may make such arrangements as they may desire for the protection, removal or relocation of property in advance of construction.
 2. *Public Owned Land or Utilities:* If an obstruction is of public ownership, the Contractor shall notify the appropriate agency, and obtain any necessary permit or license, forty-eight hours before beginning any operations affecting the obstruction. All work shall conform to the current standard and specifications of the agency, and shall be reviewed by the agency before the work is started.

At the contractor's request, the Engineer will furnish information as to what licenses or permits are required.
- B. **Clearing Limits:** The contractor shall limit the clearing operation to not over one mile ahead of the construction operation and shall follow up with restoration immediately after completion of construction.

- C. **Protection of Areas Outside of Construction:** Areas outside of the construction area shall be preserved in their natural state. If the contractor damages an area outside of the construction area, the damage will be repaired to its original condition at no additional cost to the City.
- D. **Compliance with Easements:** A copy of all easements associated with this contract are included in the Special Provisions to the contract. The contractor shall take all actions necessary to comply with the requirements of these easements and the cost of this compliance shall be included in this item.

2102 EARTHWORK

2102.1 SCOPE

This section governs the performance of all work required to excavate, remove, dispose or compact all materials encountered within the limits of the project, at the locations shown on the plans, in accordance with the requirements of applicable Sections of the General Conditions and Covenants, and as provided for in the Special Conditions.

2102.2 DEFINITIONS:

- A. **Grading:** Grading as used herein shall mean the performance of all excavation, embankment, and backfill in connection with the construction of all improvements.
- B. **Excavation:** Excavation is defined as the removal of materials from the construction area to the lines and grades shown on the plans.
 - 1. *Unclassified Excavation:* Unclassified excavation is defined as the removal of all material encountered regardless of its nature. All material excavated will be considered as Unclassified Excavation unless the Special Conditions specify Classified Materials.
 - 2. *Rock Excavation:* Rock excavation is defined as the removal of all rock materials which cannot be excavated with a backhoe, trenching machine, drag line, bulldozer, highlift, or similar excavating equipment without the use of explosives, rock rippers, rock hammers or jackhammers.
 - 3. *Earth Excavation:* Earth excavation is defined as the removal of all material not defined as rock.
- C. **Embankment or Backfill:** Embankment or backfill is defined as the placing and compacting of material in the construction area to the lines and grades shown on the plans.
 - 1. *Unsuitable Material:* Unsuitable material is defined as muck, frozen material, organic material, top soil, rubbish, and rock with a maximum dimension greater than 24".
 - 2. *Suitable Material:* Suitable material is defined as entirely imperishable with that portion passing the No. 40 Sieve having a liquid limit not exceeding 40 and a plastic index not exceeding 25, when tested in accordance with ASTM D423 and D-424, respectively.
 - 3. *Rock Embankment:* Material for rock embankment shall be free of unsuitable material and shall contain, by volume, greater than 10 percent rock or gravel having a maximum dimension greater than 3" but not greater than 24".

4. *Earth Embankment:* Material for earth embankment shall be free of unsuitable material and shall, contain by volume, less than 10 percent rock or gravel having a maximum dimension greater than 3".
- D. **Borrow:** Borrow is defined as accepted material excavated from an area outside of the project limits and required for the construction of the embankment.
- E. **Waste:** Waste is defined as excavation material not used in the embankment and disposed of outside of the embankment areas.
- F. **Structures:** Structures as used herein refers to bridges, culverts, storm sewer and/or sanitary appurtenances, retaining walls and similar construction.

2102.3

GENERAL CONSTRUCTION METHODS:

- A. The Contractor shall adhere to any and all statutes regarding the notification of utilities prior to beginning any work within public right-of-way. Relocation or protection of any existing utilities located in street right-of-way shall be governed by the General Conditions and Covenants. The relocation and/or protection of any utility that is shown on the plans, that lies within a utility easement and is endangered by this construction shall be the responsibility of the Contractor.
- B. The Contractor shall make every reasonable effort to protect private facilities. These facilities may not be shown on the plans. When these facilities are disturbed or damaged by the work, the Contractor shall make necessary arrangements for repairs to the facilities for continuous service prior to the close of that work day.
- C. It shall be the responsibility of the Contractor to protect all property lot corners and control monumentation. Should it be necessary to disturb any such monument, whether stake, pin, bar, disk, box, or other, it remains the responsibility of the Contractor to reference such markers prior to removal, reset, them, and file such relocations or monumentation documents as the law may require. Any such references, removal, replacement and certification of monuments shall be performed by, a registered licensed surveyor. A copy of all such certification documents shall be provided to the Engineer prior to final payment. Any monument destroyed or improperly reset by the Contractor may be replaced by the Engineer to the standards required by law at the expense of the Contractor.
- D. Grading, excavation and backfilling for all improvements, shall be made to the lines, grades and cross sections indicated by the plans.
- E. In addition, to any erosion control measures shown on the plans, the Contractor shall schedule and conduct his operations in such a manner and shall provide any necessary control facilities to protect downstream and adjacent properties from pollution, sedimentation or erosion caused by the grading operations. Any pollution or damage occurring shall be the responsibility of the developer, property owner and/or contractor that has day to day operational control of the site.
- F. During construction, the graded area shall be maintained by the Contractor in such condition that it will be well drained at all times. Roadway ditches, channel changes, inlet and outlet ditches and other ditches in connection with the roadway shall be cut and maintained to the required cross section. All drainage work shall be performed in proper sequence with other operations. All ditches and channels shall be kept free of debris or obstructions.

2102.4**EXCAVATION**

- A. All suitable material removed by excavation shall be used as far as practicable in the formation of embankment as required to complete the work. The Contractor shall sort all excavated material and stockpile when necessary, so as to provide suitable materials for embankments.
- B. All excavated material which is suitable for top soil shall be used before any top soil is obtained from a borrow source. Top soil material secured from excavations shall be stockpiled at locations acceptable to Owner.
- C. After removal of the roadway excavation material to the required section, all material between lines 12" outside of the curbs and within the top 6" of the subgrade shall be compacted to 95 percent of maximum density for the material.
- D. Rock encountered within the full width of the roadway, toe of slope to toe of slope, shall be undergraded to an elevation of 6" below the finished subgrade elevation. Care shall be taken to avoid overshooting when blasting. Rock shall be removed in such a manner as to leave no excessive water pockets in the surface.
- E. Areas of undergrading or overbreak in rock between lines 1' outside of - the curbs shall be backfilled with spalls, rock fragments or a granular type material. Backfill materials shall have a plasticity index not to exceed 14 and a gradation such that at least 50 percent of the material will be retained on the No. 4 sieve.

2102.5**UNDERGRADING**

Where materials are encountered which are deemed as unsuitable by the Engineer for use in the work, they shall be removed to the depth and limits as ordered, by the Engineer.

Areas undergraded shall be backfilled with one of the following materials:

- A. Rock fragments or spalls.
- B. A granular type material having a plasticity index not to exceed 10 and a gradation such that at least 50 percent of the material will be retained on the No. 4 sieve and not more than 40 percent will pass the No. 10 Sieve.
- C. A material meeting the requirements of ASTM D448, Size No. 67.

2102.6**EMBANKMENT**

- A. **General:** The embankments shall be constructed using suitable materials, as herein defined, procured from excavations made on the project site or from borrow areas as required to complete the grading work.
- B. **Starting the Embankment:**
 - 1. Where embankments, regardless of height, are placed against hillsides or existing embankments, either of which have a slope steeper than 1 vertical to 4 horizontal, the existing slope shall be benched or stepped in approximately 12" rises as the new fill is brought up in a maximum of 6" layers or lifts. The material bladed out, the bottom of the area cut into, and the embankment material being placed, shall be compacted to the required density. Material cut out, bladed into place and compacted shall not be measured and paid for directly but will be considered as incidental work. The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material removed before starting the embankment work.

2. Where embankments 24" or less in depth are to be placed on areas covered by existing pavement, the existing pavement shall be removed and the cleared ground surface shall be compacted to the specified density. Where embankments greater than 24" in depth are to be placed on areas covered by existing pavement, the existing pavement shall be broken into pieces not larger than 12" maximum dimension, left in place and the embankment started thereon.
- C. **Placing Earth Embankment:** Earth shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed 6" in thickness (loose state) and shall be compacted to not less than the required density before the next layer is placed thereon. Contractor may request placement of layers thicker than 6" if he can demonstrate the ability to obtain proper compaction for the full layer thickness. As the compaction of each layer progresses, continuous blading, or dozing will be required to level the surface and to insure uniform compaction. Embankment construction shall not be performed when material contains frost, is frozen or is snow covered.
- D. **Placing Earth and Rock Embankment:** When earth and scone or rock fragments are mixed in the embankment, all stones or rock fragments exceeding the thickness of the compacted lift shall be disposed of by being incorporated into the embankment outside the limits of the proposed surfaced areas. The thickness of the layer in these areas may be increased if necessary to accommodate the rocks, but shall nor exceed 15" in thickness (loose state). The stones or rock fragments are to be placed so there will be no nesting.
- E. **Consolidated Rock Embankment:**
1. When the excavated material consists predominantly of stone or rock fragments of such size that the material cannot be placed in layers of the thickness prescribed, such material shall be placed in the embankment in layers having a thickness of the approximate average size of the larger rocks but not to exceed 24". Rocks or boulders too large to permit placing in a 24" layer shall be reduced in size as necessary to permit placement. Rock shall not be dumped in place but shall be distributed by blading or dozing in a manner to insure proper placement in final position in the embankment. The spalls and smaller scone fragments shall be left on the surface of each layer as formed. Each layer shall be thoroughly consolidated before the next layer is placed.
 2. The top 12" of the embankment shall not contain material having a maximum dimension greater than 3". The rock fragments or crushed stone shall be well graded to form a dense mass when compacted.
- F. **Compacting the Embankment:**
1. Before placing any embankment, the surface of the existing ground shall be prepared as heretofore specified, moistened as required, and the top 6" compacted to a density of 90 percent.
 2. All embankment shall be compacted to a density of at least 90 percent of the maximum density for the material used as determined by AASHTO T-99. In addition to the above required compaction, the subgrade between lines 12" outside of the curbs and within the top 6" of the subgrade shall be compacted to a density of at least 95 percent of the maximum density for material used as determined by AASHTO T-99. All compaction shall be within a tolerance of \pm 2% of the optimum

moisture at maximum density as determined by the Moisture Density Curve obtained. For example, if the optimum moisture is 15%, then the range will be 17% to 13% .

3. All the work involved in either adding moisture to or removing moisture from embankment materials to within these moisture limits shall be considered incidental to the completion of the grading operation.

- G. **Moisture - Density Determination:** In-place density and moisture content of the embankment will be determined by AASHTO T-238.

2102.7 FINISHING

- A. In areas where sodding or seeding is proposed, the upper 12" of the surface area shall be earth material. The top 6" shall be suitable for sustaining grass.
- B. Except where other permit or utility work is in progress, the graded surface shall be made free of rock, concrete, and brick, or fragments thereof, or rubbish and shall be finished to the lines, grades, and cross- section indicated on the plans, including shoulder, berm and sidewalk spaces.
- C. The Contractor shall repair any damaged surface, and shall not use any finishing equipment that will leave a marred surface. When the subgrade preparation is included as a part of the finishing, the work shall be accomplished according to the requirements of Section 2201 entitled "Subgrade Preparation," and shall be considered incidental to finishing the grading work.

2102.8 CLEANUP

Cleanup shall follow the work progressively and final clean-up shall follow immediately upon the completion of work. The contractor shall remove from the site of the work all equipment, tools and discarded materials, and other construction items. The entire right-of-way or easement shall be left in a finished and neat condition. Cleanup shall be considered as incidental to the completion of the grading work.

2103 TEMPORARY EROSION AND SEDIMENT CONTROL

2103.1 DESCRIPTION

This item shall consist of temporary soil erosion sediment and water pollution control measures in accordance with the City of Norman's Engineering Design Criteria for the duration of the contract. The temporary pollution control provisions contained herein shall be coordinated with the permanent soil erosion control features specified elsewhere in the contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction and post construction period. These control measures shall at no time be used as a substitute for the permanent control measures unless otherwise directed by the Engineer and they shall not include measures taken by the Contractor at his expense under Subsections 2103.3 (A) through (E) to control conditions created by his construction operations. The temporary measures shall include dikes, dams, berms, sediment basins, fiber mats, jute netting, temporary seeding, straw mulch, asphalt mulch, plastic liners, rubble liners, dikes, slope drains and other devices specified by the Engineer.

2103.2 PRECONSTRUCTION CONFERENCE

Prior to the start of the applicable construction, the Contractor shall submit for review his schedules for accomplishment of soil-erosion control work and his plan to keep the area of erodible earth material to a minimum. He shall also submit for acceptance his proposed method of soil erosion control on

construction and haul roads and material sources and his plan for disposal of waste materials. No work shall be started until the soil erosion control schedules and methods of operations have been reviewed and accepted by the Engineer.

2103.3 CONSTRUCTION REQUIREMENTS

- A. The Engineer has the authority to define erodible earth and the authority to limit the surface area of erodible earth material exposed by preparing right-of-way, clearing and grubbing, the surface area of erodible earth material exposed by excavation, borrow and embankment construction operations (except for commercial operations) and to direct the Contractor to provide temporary pollution control measures to prevent contamination of adjacent streams, other water courses, lakes, ponds or other areas of water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains and use of temporary mulches, mats seeding or other control devices or methods accepted by the Engineer as necessary to control soil erosion.
- B. The Contractor will be required to incorporate all permanent soil erosion control features into the project at the earliest practicable time as outlined in his acceptable schedule. Temporary pollution control measures shall be used to prevent or correct erosion that may develop during construction prior to installation of permanent pollution-control features, but are not associated with permanent control features on the project.
- C. The Engineer will limit the area of preparing right of way, clearing and grubbing, excavation, borrow and embankment operations (other than in commercially operated sources) to be proportional to the Contractor's capability and progress in keeping the finish grading, mulching, seeding, sodding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal conditions make such limitations unrealistic, temporary soil erosion control measures shall be performed. The amount of surface area of erodible-earth material exposed at one time shall not exceed 750,000 ft² for each excavation operation, 750,000 ft² for each material source operation (other than from commercially-operated sources), 750,000 ft² for each preparing of right-of-way operation or 750,000 ft² for each clearing and grubbing operation, unless otherwise shown on the plans or with prior acceptance by the Engineer in writing.
- D. The Contractor shall maintain the top of the earthwork in all roadway sections through all construction stages in such a manner as to permit the runoff of precipitation to the outer edges. When directed by the Engineer, earth berms shall be constructed along the top and/or bottom edges of embankment or cuts to intercept the runoff water at the close of the day's grading operations. Earth berms shall be compacted to the satisfaction of the Engineer. Temporary slope drain facilities shall be provided to carry the runoff to the bottom of the slopes. The slope drains may be of flexible or rigid construction, but shall be capable of being readily shortened or extended as the cut or fill progresses. Pipe and/or sheeting shall be provided at the entrance to the temporary slope drains, and where necessary, energy dissipaters shall be provided at the outlet. Open drains shall be stabilized as necessary to prevent erosion. On embankments with flat slopes where slope drains are impractical, temporary grasses and/or mulch stabilization shall be constructed concurrently with the embankment formation.
- E. Should preventive measures fail to function effectively, the Engineer will require the Contractor to act immediately to bring the erosion and siltation under control by whatever additional temporary means are necessary.

F. The Contractor shall also conform to the following practices and controls. All labor, tools, equipment and incidentals to complete the work will not be paid for directly but shall be considered as subsidiary work to the various items included in the contract.

1. Waste or disposal areas and construction roads shall be located and constructed in a manner that will minimize the amount of sediment entering streams.
2. Frequent fordings of live streams will not be permitted; therefore, temporary bridges or other structures shall be used wherever an appreciable number of stream crossings are necessary. Unless permission is granted in writing by the Engineer, mechanized equipment shall not be operated in live streams.
3. When work areas or material sources are located in or adjacent to live streams, such areas shall be separated from the stream by a dike or other barrier to keep sediment from entering a flowing stream. Care shall be taken during the construction and removal of such barriers to minimize the muddying of a stream.
4. All waterways shall be cleared as soon as practicable of falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.
5. The Contractor shall take sufficient precautions to prevent pollution of streams, lakes and reservoirs with fuels, oils, bitumens, calcium chloride or other harmful materials. He shall conduct and schedule his operations so as to avoid or minimize siltation of streams, lakes and reservoirs and to avoid interference with movement of migratory fish.
6. The contractor shall take sufficient precautions to prevent airborne pollution. Should these precautions fail, the Engineer shall require the Contractor to act immediately to bring the airborne pollution under control by whatever additional means are necessary. If the airborne pollution cannot be prevented, the contractor shall stop whatever construction activity is causing the pollution. When the wind velocity is greater than 15 mph, the contractor is strongly advised to not start any construction activity which shall cause airborne pollution.
7. The Contractor shall take sufficient precautions to prevent any pollutant such as discarded building materials, litter, chemicals, fuels, fluids or sediment from entering the municipal separate storm sewer system (MS4).

2104 SODDING AND SEEDING

2104.1 SCOPE

The work covered under this item includes all supervision, labor, materials and equipment needed for establishing a permanent, erosion preventing vegetation cover. All areas disturbed by the construction of this project shall be sodded as specified herein and where noted on the Drawings. Seeding shall only be used if approved as an acceptable alternative by the Engineer.

2104.2 PRODUCTS

Sod:

1. Bermuda grass sod to be used as source material shall be a thick stand of common Bermuda grass growing on fertile topsoil. Types of Bermuda grass other than "Common" may not be used unless accepted by the Engineer. The vegetative parts (rhizomes, stolons, and roots) of Bermuda grass shall be viable as indicated by a dense, deep rooted stand.
2. The source for sod shall be free of reproducing parts of weeds classified as "Prohibited Noxious" and shall be as free of other legally "Restricted Noxious" plant materials as required by the Oklahoma Department of Agriculture Seed Law. The proposed source of sod will be accepted by the Engineer before the beginning of sodding operations. Prior to acceptance, the area shall not be tilled or mowed. However, all vegetative growth exceeding 3" height shall be mowed and the residue removed prior to harvesting the sod or sprigs.
3. The sod shall be moist when excavated from the source and shall be kept moist until planted. Sod in storage which becomes dry shall not be remoistened and used, but shall be discarded.
4. Sod material shall consist of vegetative parts (rhizomes, stolons, and roots) of Bermuda grass with an appreciable quantity of adhering soil.
5. Solid Slab Sod shall be rectangular slabs of Bermuda grass. Bermuda grass vegetative parts shall exist throughout the slab, and shall be obtained from soils with a minimum P.I. of 3. The slab must have a dense vegetative growth and be capable of being transported in a condition closely resembling its original state.

B. Seed:

1. Seed labeled in accordance with the applicable portions of U.S. Dept. of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable.
2. The kind and quantity of seed to be furnished and planted shall be as follows:

<i>Type</i>	<i>Lbs. per 1,000 Sq. Ft.</i>	<i>Lbs. per Acre</i>
Bermuda Grass, hulled	0.5	22
Bermuda Grass, unhulled	0.75	33
Fescue KY31	1.0	44
Old World Blue Stem	0.14	6.1

- C. **Fertilizer:** Fertilizer of 10-20-10 grade and ammonium nitrate (33.5% N), uniform in composition, free flowing, and suitable for application with accepted equipment, shall be provided. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.
- D. **Vegetative Mulch:** Vegetative mulch shall be native prairie hay, slough grass hay, or other grass-like material that may be accepted. Hay from leguminous plants and straw from threshed cereal grains will not be acceptable. While the grade of the hay is unimportant, it shall not be of such a brittle nature that it cannot be anchored in the soil satisfactorily, nor shall it be so rotten or moldy that it will deteriorate rapidly. The hay shall not exist in, or be broken into, lengths that are too short to be adequately held in place on the soil. Hay cut with a rotary-type cutter will not be accepted. The hay shall have been baled dry, in bales of uniform size and relative weight, and shall be dry when used. The hay shall be suitable for spreading with standard mulch blower equipment. The material shall be free from the seeds and other reproductive parts of weeds whose seeds are classed as "prohibited" by the Oklahoma State Board of Agriculture; shall contain no Johnson grass and other weeds on said Board's noxious weed list, and shall be practically free of any plants that could interfere with roadside turf or increase the cost of maintenance.

All vegetative mulching material in storage shall be fully protected against wet weather.

2104.3

CONSTRUCTION METHODS

- A. **Preparation:** Unless otherwise specified, the entire construction area and other disturbed areas (including borrow areas) shall be spread with a minimum 3" thick layer on topsoil which is free of trash, shrubs, trees and other foreign matter. Grubbed and scarified material earlier removed and stockpiled may be used as topsoil material if sufficiently free of such foreign matter.
- B. **Application:**
1. Seed:
 - (a) The area shall be seeded with Bermuda or Fescue grass seed at a rate as shown above. Seed shall be mixed with an equal amount of fertilizer at least 12 hours prior to seeding. The admixture shall be seeded by mechanical hand seeder or accepted power equipment. Whenever grass begins to sprout, an application of 200 lbs. of 10-20-10 commercial fertilizer shall be applied to the area, preferably after the ground has been thoroughly saturated. After two or three months of planting, the seeded site shall be top dressed with 8 lbs. per 1,000 so. ft. or 350 lbs per acre of 33-00.

- (b) The Contractor shall rewater or reseed the areas as often as necessary until the grass appears live over the entire area. After the grass appears live over the entire area and when, in the opinion of the Engineer, the grass is living and growing, it shall be the Contractor's responsibility to water the grass until completion and final acceptance of the project. Established growth must be over 95% of the entire area.

2. Sod:

- (a) The slabs of sod shall be placed soil side down. They shall be placed in rows, which on slopes shall run perpendicular to the flow of water. Each slab shall fit tightly against the edge of adjoining slabs and shall be placed so that the vertical joints are not continuous across adjoining horizontal rows. Voids shall be filled with additional sod. All slabs shall have firm contact with the soil underneath.
- (b) After the slabs have been placed, the sodded area shall be thoroughly watered. When sufficiently dry, additional voids shall be filled with good soil and watered again. The area shall then be thoroughly watered daily for a period of at least seven days after placement.
- (c) Soil moisture shall exist throughout the zone from 1 inch below the surface to at least 5 inches below the surface at the time of planting. The required moisture content of the soil may be estimated and judged closely by the hand-squeeze test. The soil should readily form a tight cast when squeezed in the hand. The cast should break into two pieces without crumbling and without leaving excess water on the hand after casting.
- (d) Fertilizer shall not be placed on hard or glazed surfaces. Fertilizer shall be applied at the rates shown on the Plans.
- (e) When satisfactory results can be obtained, disking for soil preparation, weed removal, and incorporation of fertilizer may be accomplished in one operation.
- (f) If a fertilizer containing phosphorous is specified, one half of the fertilizer shall be applied before placement of solid slab sod and shall then be incorporated into the soil by disking. After placement and compaction of the sod, the remaining half of the fertilizer shall be applied and immediately incorporated into the soil with water.
- (g) Fertilizer containing nitrogen only shall be applied after the sodding and sprigging operations have been completed.

- C. **Season:** If the Construction work is not completed during the normal planting season (April 15 through September 1) for Bermuda and/or Fescue, the Contractor shall seed the entire area with an accepted temporary vegetative cover, such as wheat, oats or rye grass to prevent erosion until the following spring at which time the Contractor will be required to return and prepare the area to be seeded as specified above and seed the entire area with Bermuda grass as specified above at no additional cost to the Owner. All areas which have eroded will at this time be brought back to original line and grade as directed by the Engineer.

- D. **Water Supply:** Water used in the sodding and/or seeding operation will not be furnished by the Owner. The Contractor must make provisions to obtain water for this operation at his own expense. It will be the Contractor's responsibility to transport the water to the area where it is needed.

2105 BIOFILTRATION MEDIUM

2105.1 GENERAL REQUIREMENTS

A. SCOPE:

This item shall govern mixing and placing medium for a biofiltration basin intended to treat storm runoff. This specification is applicable for projects or work involving either inch-pound or SI units. Within the text inch-pound units are given preference followed by SI units shown within parentheses.

B. ABBREVIATIONS:

Wherever the words, forms, or phrases herein defined, or pronouns used in their stead occur in these specifications, in the contract or in the Advertisement of any document or instrument herein contemplated or to which these specifications apply, the intent and meaning shall be as defined in Sections 1008 and 1009.

C. CODES, SPECIFICATIONS, AND STANDARDS:

Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise specified.

D. QUALITY ASSURANCE

1. Field tests shall be completed as specified in this Section.

E. SUBMITTALS

The submittal requirements of this specification item include:

1. A signed statement provided by the Contractor that:
 - (a) A laboratory analysis has been conducted of the actual mixture being proposed and has been verified as meeting the specifications below. The date of the laboratory analysis must be no more than six months prior to the date of installation of the biofiltration medium. A copy of the laboratory results must be provided.
 - (b) No "sandy loam" (aka "red death") fill material is included in the mixture.
 - (c) Reports the source of organic matter.
 - (d) Laboratory reports of analyses results documenting that the mixture meets the following specifications: Particle size distribution performed per ASTM D-422:
 - (1) • Coarse fragments + sand content of 70 - 90% by weight
 - (2) • Clay content of 3 - 10% by weight
 - (3) • Silt + clay content \leq 27% by weight
 - (e) Percent organic matter of 0.5 - 5% by weight per ASTM

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2. Contractor's statement, along with lab results showing, that the biofiltration medium has been tested by a laboratory using approved procedures and meets the criteria as noted in Table 1 below:

Table 1 - Biofiltration Medium Characteristics

Parameter	Results*	Criteria	Criteria Met?*
Percent Sand + Coarse Fragments (ASTMD-422)		70 - 90%	
Percent Clay (< 0.002 mm)		3 - 10%	
Percent Silt + Clay (< 0.05 mm)		≤ 27%	
Percent Organic Matter (ASTM D-2974)		0.5 - 5%	
Is any "Red Death" included in medium?		None allowed	
Is the mixture free of trash, stones, weeds, or other undesirable material?		None allowed	
Is the medium well-mixed and homogenous?		Must be homogenous	

* Laboratory Must Fill In These Cells

Table 2 - Biofiltration Medium Testing and Installation Dates

Date of Laboratory Analysis (earliest)*	
Date of Medium Installation*	
Time between Dates (months)*	
Criteria for Time Between Dates (months)	6
Is Criteria Met?*	

* Contractor Must Fill In These Cells

2105.2 PRODUCTS

A. ACCEPTABLE MATERIALS

The following mixture (% by volume) should create an appropriate biofiltration medium, subject to specific characteristics of the topsoil, which may exhibit considerable variability:

1. 70-80% concrete sand per ASTM C33 and/or screened decomposed granite sand

2. 20-30% screened bulk topsoil (chocolate loam is also acceptable)
3. The source materials must be free of stones, roots, or other similar objects larger than two inches. Additionally, it should be free of trash, other undesirable material, and should not contain weeds or weed seeds.
4. The ingredients shall be well-mixed to create a homogenous medium.

B. UNACCEPTABLE MATERIALS

A commercially available fill material that should not be used is typically marketed as "sandy loam." This product is often referred to by landscapers as "red death", which refers to the color of material, and is an infertile fill material that has poor drainage characteristics. All materials shall be free of Bermuda grass, Quackgrass, Johnson grass, or other noxious weeds, their roots or seeds.

C. MEASUREMENT

Biofiltration medium will be measured by the cubic yard (cubic meters: 1 cubic meter is equal to 1.196 cubic yards) in its final position based upon the average end areas, calculated from pre-construction cross sections and plan grades. The plan quantities for biofiltration medium will be used as the measurement for payment of this item.

D. PAYMENT

All work performed as required herein and measured as provided under "Measurement" will be paid for at the unit bid price. The bid prices shall include full compensation for furnishing all labor; all materials; all royalty and freight involved; all hauling and delivering on the road; and all tools, equipment, and incidentals necessary to complete the work. Payment will not be made for unauthorized work.

2105.3

CONSTRUCTION METHODS

A. EROSION CONTROL

Prior to commencing this work, all required erosion control and environmental measures shall be in place as indicated on the approved site plan and/or modified.

B. SCHEDULING, DELIVERY, STORAGE, AND SIGNAGE

The biofiltration medium must be delivered to, or mixed at, the site prior to the mid- construction conference. The medium must be certified as meeting the required specifications by the Engineer and approved by the Project Inspector. The medium must be stored on-site separate from other materials and covered to prevent erosion of the mixture by rainfall and runoff. The medium must have a prominent tag affixed that reads "BIOFILTRATION MEDIUM FOR WATER QUALITY POND."

C. PLACEMENT

After construction is complete, stabilize all areas draining to the biofiltration basin. Permanent controls will be cleaned out and filter medium will be installed after stabilization of the site. Install geotextile fabric per the Biofiltration Bed detail provided in EDC Figure 7004-3.

Biofiltration medium shall be placed in lifts of 12 to 18 inches without using heavy operating equipment or compaction. Lifts should be lightly watered to

encourage soil settling. The final surface must be raked flat. The Engineer must be notified 24 hours prior to installation of the biofiltration medium and must approve and certify the installation.

D. SHRINKAGE

Some shrinkage of the medium is to be expected after installation, in the range of 5-15%. As a general recommendation about 20 inches of medium should be installed to achieve a depth of 18 inches.

2106 BASIN LINERS

2106.1 GENERAL REQUIREMENTS

A. SCOPE:

This specification is to govern the furnishing of all materials, labor, equipment, tools, and other services to wet pond basin liners as specified in this section and as shown on the drawings.

All wet ponds require an impermeable liner. Impermeable liners are also required where hazardous material is present. If a liner is required and there are multiple controls in series, liners are only required for the first control in series. Impermeable liners may be clay, concrete, geosynthetic clay liner (GCL), geomembrane, or other approved liner, depending on the application.

B. ABBREVIATIONS:

Wherever the words, forms, or phrases herein defined or pronouns used in their stead occur in these specifications, in the contract or in the Advertisement of any document or instrument herein contemplated or to which these specifications apply, the intent and meaning shall be as defined in Sections 1008 and 1009.

C. CODES, SPECIFICATIONS, AND STANDARDS:

Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise specified.

D. QUALITY ASSURANCE:

A construction Quality Assurance/Quality Control (QA/QC) Plan must be prepared by the engineer for the purpose of providing a basis for all construction/installation and testing of the liner system during the liner construction process. The QA/QC plan must be approved by the City prior to liner construction.

1. For clay liners, the QA/QC plan must include, but not be limited to, the following items: recordkeeping documents, including daily construction reports, inspection and test data sheets, non-conformance and corrective measure reports, design and specification changes, and all other documentation accumulated by inspection personnel during construction; pre-construction soil sampling, testing and documentation protocol, including the type of information to be documented for each sample, and the test procedures to be used; protocol during construction, including the monitoring of the subgrade, as well as material placement (including items such as density testing and moisture content, lift thickness and bonding, processing of soil and reduction of clods, footed compaction equipment, and number of passes of compaction equipment), sampling and testing procedures, frequencies and other

requirements. Also, the handling of any liner perforations as a result of various types of testing must be addressed along with guidance on how to address any deficiencies that may be discovered, including corrective measures to be taken.

2. For geomembrane and GCL liners, the QA/QC plan must include, but not be limited to, the following items: geomembrane/GCL manufacturing and delivery data requirements, including raw materials properties, roll and production quality assurance and control data requirements, along with transportation, handling and storage requirements, and conformance testing; installer qualifications requirements; installation requirements, including surface preparation, system anchorage, geomembrane/GCL placement (including, but not limited to panel identification, placement and installation schedule), seaming information (including, as applicable to geomembrane or GCL, seam layout, preparation, equipment, weather conditions, trial welds, general procedures, non-destructive testing and destructive testing), identification of defects and repair procedures, and geomembrane/GCL acceptance procedures.
3. All liner construction and QA/QC activities must be under the supervision of an independent licensed engineer with experience in geotechnical engineering. The engineer or designated representative must be on site during all significant liner construction activities, including but not limited to:
 - (a) At the beginning of liner construction to inspect subgrade acceptability;
 - (b) During the processing of clay liner material for placement to ensure adequate moisture conditioning and particle size reduction;
 - (c) During placement of clay liner lifts to ensure 6 inch maximum lift depth is not exceeded and compaction is sufficient;
 - (d) During all geomembrane and GCL installation;
 - (e) During clay and geomembrane liner testing;
 - (f) Prior to placement of successive clay lifts to verify acceptability of prior lift surface;
 - (g) During construction of penetrations and any other construction that will affect the integrity of the liner (access ramps, pump pads, etc.).
 - (h) During placement of protective soil layer.

E. SUBMITTALS

Following completion of the liner construction, a report must be prepared under the direction of and sealed by the engineer and submitted to the City. The report is intended to provide documentation of all installation methods and testing procedures conducted during the installation of the liner and to provide evidence that the liner was constructed in accordance with the construction plans, technical specifications and QA/QC plan.

F. PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Transportation:

Provide geomembrane liners in rolls wrapped with protective covering to protect the geomembrane from mud, dirt, dust, and debris. The geomembrane shall be free of defects or flaws which significantly affect its physical properties. Label each roll of fabric in the shipment with a number or symbol to identify the thickness, length, and manufacturer's roll number. Folded sections of panels are not acceptable and shall not be used in High Density Polyethelene (HDPE) liner construction. Creased sections of panels (which are not a normal part of the manufacturing process for some HDPE manufacturers) are not acceptable and shall not be used in the geomembrane liner construction. The geomembrane rolls shall be packaged and shipped by appropriate means so that no damage is caused. Transportation shall be the responsibility of the installer.

2. Delivery:

Off-loading and storage of the geomembrane is the responsibility of the installer. The installer shall be responsible for replacing any damaged or unacceptable material at no cost to the Owner. No off-loading shall be done unless the Engineer is present. Damage during off-loading shall be documented by the Engineer. All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the Engineer. The Engineer will be the final authority on determination of damage.

3. On-Site Storage:

The geomembrane shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, or other damage. A sacrificial cover must be used to protect the HDPE if stored on site more than 6 months. The rolls shall be stored in such a manner as to avoid shifting, abrasion, or other adverse movements that can damage the geomembrane liner material. The rolls shall be stored on a prepared surface (not wooden pallets) and should not be stacked more than three rolls high.

2106.2

SAMPLING AND COMPLIANCE REQUIREMENTS

A. A competent laboratory must be maintained by the producer of the geomembrane at the point of manufacture to ensure quality control in accordance with ASTM testing procedures. The laboratory shall maintain records of its quality control results and provide a manufacturer's certificate to the Engineer prior to shipment. The certificate shall include:

1. Name of manufacturer.
2. Chemical composition. Product description.
3. Roll numbers if a geomembrane.
4. Date of Production.
5. Statement of compliance to specification requirements.
6. Signature of legally authorized official attesting to the information required.

B. WARRANTY

The membrane manufacturer shall provide warranty coverage on the membrane for a period of 5 years from date of installation. The manufacturer shall replace or repair any defective materials and workmanship including significant leakage, abnormal aging, deterioration of materials, and other defects of the membrane liner which fail within the warranty period.

The Contractor shall furnish the Owner with a written warranty covering the requirements of this paragraph.

2106.3

GENERAL DESIGN GUIDELINES

A. SITE

The analysis and design should entail a comprehensive review of the site specific conditions to determine the most appropriate type of liner for the site, and should include a stability assessment of the pond side slope. The criteria in item 7102.2-7102.12 is applicable to any size basin or pond, while the criteria in item 7102.13 may be applied to sedimentation basins, filtration basins and retention ponds that are less than 1,000 square feet in area.

When required for sedimentation/filtration basins, the liner must underlie both the sedimentation basin and filtration basin and any gabion wall areas.

B. LINER SUBGRADE

1. A stable subgrade is very important in the construction of the pond or basin. Careful evaluation must be conducted to ensure the liner will be placed on a suitable base. If any voids are encountered, proper geotechnical analysis must be performed to ensure that the integrity of the liner can be maintained. Proof rolling must be conducted as necessary to determine the suitability of the subgrade, and any suspect areas must be reworked and recompact, or the weak soils removed and replaced with suitable fill material. The subgrade for geomembrane or GCL must be smooth and contain no particles greater than 0.375 inch diameter.

C. LINER CHARACTERISTICS

At least three types of liners can be considered, including a clay liner of appropriate thickness and permeability, a geomembrane liner, and GCL. Alternative liner designs may also be considered.

1. If geomembrane is used, it must be a HDPE liner, have a minimum thickness of forty (40) mils and be ultraviolet resistant. Liners on side slopes may need to be textured depending on slope angle and type of protective cover over the liner. The liner requirements for a smooth HDPE geomembrane shall meet the following minimum average roll values (MARV): Tensile Strength at Break = 150 lb/in-width; Tensile Strength at Yield = 80 lb/in-width; Elongation at Break = 700%; Elongation at Yield = 13%; Tear Resistance = 25 lb; Puncture Resistance = 70 lb; Carbon Black Content = 2-3%; Notched Constant Tensile Load – 300 hr; Oxidative Induction Time = >100 mins. The liner requirements for a textured HDPE geomembrane shall include the following MARVs: Tensile Strength at Break = 55 lb/in-width; Tensile Strength at Yield = 80 lb/in-width; Elongation at Break = 100%; Elongation at Yield = 12%; Tear Resistance = 25 lb; Puncture Resistance = 55 lb; Carbon Black Content = 2-3%; Notched Constant Tensile Load – 300 hr; Oxidative Induction Time = >100 mins. Use of a

geomembrane also requires that a suitable geotextile fabric be placed on the top and bottom of the membrane for puncture protection if any particles with diameters greater than 0.375 inch are present in the cover soil or subgrade surface, respectively. The geotextile requirements shall meet the following MARVs: Grab Tensile Strength = 220 lbs; Puncture Resistance = 125 lbs; Trapezoidal Tear Strength = 95 lbs; Mullen Burst = 450 psi; Apparent Opening Size (AOS) = 80 Sieve. The designer must demonstrate the liner's impermeability, and the method of liner protection to be used during maintenance and sediment removal operations. Equivalent methods for protection of the geomembrane liner will be considered by the Public Works Director, or designee on a case by case basis.

Equivalency will be judged on the basis of ability to protect the geomembrane from puncture, tearing and abrasion. Individuals installing geomembrane liners must be trained and/or certified by the liner manufacturer.

2. If a GCL is used, it must meet the manufacturer's minimum property values. The designer must demonstrate the GCL's low permeability, and the method of GCL protection to be used during maintenance and sediment removal operations. Equivalent methods for protection of the GCL will be considered by the Engineer on a case by case basis. Equivalency will be judged on the basis of ability to protect the GCL from puncture, tearing and abrasion. Individuals installing GCL's must be trained and/or certified by the GCL manufacturer.
3. If a clay liner is used, it must be designed for the site-specific conditions by a geotechnical engineer and must have a minimum thickness of twenty four (24) inches or greater. Coefficient of permeability must be 1×10^{-7} cm/sec or less. Other parameters must be as follows: plasticity index of not less than 15; liquid limit of not less than 30; and at least 30% clay particles passing the No. 200 sieve, with a maximum particle size of 1 inch. Soil must be processed to reduce clod size as much as possible prior to compaction and compaction of the lifts must be done using footed rollers. Clay compaction must be no less than 95% of Standard Proctor Density with a moisture content range at or a maximum 4 percentage points above optimum moisture content or 90% of Modified Proctor Density at a moisture content between 1% dry and 3% wet of optimum moisture content. Soil sampling and testing must be conducted on the borrow source and installed liner samples as applicable. Liner material verification sampling and testing should occur at frequencies which must be in accordance with the QA/QC plan. In-situ materials may be used if it can be demonstrated that all required liner parameters will be met. If the clay liner is to be overlain by a drainage layer, a suitable geotextile fabric must be placed on the surface of the liner prior to placement of the drainage layer to limit clogging of the drainage layer by the clay liner.
4. Geomembrane or GCL liner placement over excavated rock requires installation of protective material to prevent damage to the liner. Examples of protective material include spray-on fiberglass, additional clay liner material, or placement of a thick enough geotextile suitable to prevent liner damage.
5. An alternative liner design may be approved by the Engineer if it can be

demonstrated by the responsible party that the liner is equivalent to or exceeds the above requirements.

D. HANDLING OF LINER PENETRATIONS

Liner penetrations are one of the areas of the pond or basin that are most susceptible to leakage. It is critical that the design and construction of these areas pay special attention to liner continuity around these interface points. Detailed analysis must be performed related to the handling of all areas of liner penetrations including but not limited to pipe inlet and outlet structures, headwalls, and areas where concrete access ramps, maintenance pads, and pump pads interface with the liner. Penetrations for wet ponds should be placed to minimize the hydraulic head over the penetration. Consideration must be given to the need for special applications such as gaskets, clay or bentonite plugs, filter diaphragms, special backfill and compaction, and other measures to prevent leakage around all these areas.

E. PROTECTING THE LINER FROM EROSION

1. The integrity of the liner, particularly a clay liner, can be severely compromised by any erosion that may occur at the surface of the liner. The design must provide appropriate mechanisms to prevent erosion of the liner at all areas, including the inlet structure and the separation berm between the forebay and main pool of wet ponds. Additionally, the liner must be continuous under wet pond separation berms to minimize the potential for leakage at the equalization/inter-basin pipe.

F. EARTHWORK

1. Earthwork shall be in accordance with Standard Specification 2102. All surfaces to be lined shall be smooth, free of all foreign and organic material, sharp objects, , or debris of any kind. These surfaces shall provide a firm, unyielding foundation with no sharp changes or abrupt breaks in grade. Standing water or excessive moisture shall not be allowed.
2. The installer, on a daily basis, shall certify that the surface on which the geomembrane will be installed is acceptable. After the supporting soil surface has been accepted, it shall be the Contractor's responsibility to indicate to the Owner any change to its condition due to natural causes or occurrences that may require repair work.

G. PROTECTING THE LINER AGAINST DAMAGE AND LOSS OF MOISTURE

It is imperative that the clay liner be kept moist during construction and prior to the time the basin is filled. Otherwise, cracks can develop in the clay, particularly during the hotter months of the year, thereby rendering it susceptible to leakage. For wet ponds, provisions must be included in the construction documents that require the contractor to protect the liner against loss of moisture until the basin is completely filled. For all ponds, damage to unprotected clay, GCL, or geomembrane liners can also occur due to passage of equipment during construction or during future sediment removal and maintenance operations. To minimize the possibility of damage and drying, all liner designs should include a protective soil layer over the liner with a minimum thickness of 12 inches for clay liners, and 24 inches for GCL and geomembrane (the 24-inch thickness can be reduced for liners which are never to undergo traffic by heavy equipment or are otherwise protected from heavy equipment).

H. LINER PLANS AND SPECIFICATIONS

The Contractor's/Developer's engineer must prepare the necessary plans and specifications to provide clear direction for the construction of the liner and all related components. Construction details must be included for all liner cross-sections, penetrations, and any other areas requiring special attention and/or guidance to ensure proper construction. A scale drawing of the area to be lined, including a grid established across the base and side slopes of the pond or basin with target elevations shown, must also be prepared by the Contractor's/Developer's engineer. This grid will provide a basis for verification of liner thickness during construction and will be used for the purpose of recording elevation data prior to placement of the initial lift and following placement of the final lift. All required testing, standards, procedures, and material properties must be spelled out in detail in the documents. Parties who are responsible for any surveying, sampling, testing and other verification requirements must be identified in the documents.

I. GROUNDWATER CONTROL

Liners constructed below groundwater will require dewatering as necessary to allow construction of the liner. To prevent damage to the liner due to uplift pressures after termination of dewatering or during future maintenance, the liner must include placement of sufficient soil ballast or additional thickness of clay liner to resist any uplift pressures.

Alternative designs to relieve liner uplift pressure (French drain, etc.) will be considered and must be approved by the Engineer.

J. SUBMERGED INLETS AND STORM SEWERS

Due to excessive leakage issues submerged inlets and storm sewers connections to Stormwater Control Measures (SCM) are to be avoided whenever possible. In situations where site conditions require a submerged inlet or storm sewer then the portion of the inlet pipe that is placed below the water quality elevation must be designed to store water, not simply convey it. In these situations the pond liner must extend and surround the portion of the inlet pipe or storm sewer that is designed to be under water and all structural elements and piping below the water quality elevation shall be watertight. Acceptable watertight piping includes gasketed RCP, PVC, and wastewater grade HDPE. Leak testing of the system will be performed to verify that the system is watertight and able to perform as designed.

K. POND WATER LOSSES, PERFORMANCE CRITERIA AND SUPPLEMENTAL WATER REQUIREMENTS

While fluctuation of the permanent pool level is to be expected due to climatic conditions, type and extent of vegetation, phased developments and other factors, the minimum level acceptable at any time is 12" below the permanent pool (the lower limit of the marsh zone). A nearby source for make-up (supplemental) water is recommended as a way to maintain an adequate permanent pool level should the level drop. A water balance based on local data must be performed in order to demonstrate compliance with these performance criteria. The water balance should use a daily time step and account for all significant inflows (rainfall, runoff, supplemental water) and outflows (evaporation of open water, evapo-transpiration of wetland vegetation/vegetated bench, seepage, water withdrawals). A range of climatic conditions should be modeled, including but not limited to, average and dry years. The water balance serves two purposes. First, it is necessary to provide information for determining pond sizing

requirements and any supplemental (makeup) water requirements, as applicable. A minimum water level is necessary for both aquatic plant survival and, if the liner material is clay, to keep the clay moist to prevent cracking. Wet ponds that are operated and/or maintained by the City must meet the performance criteria assuming that no supplemental water is provided, unless approved by the Engineer. Second, a water balance is necessary in order to determine if the pond is experiencing a water loss in excess of normal anticipated losses. It must be performed in order to develop performance criteria for the pond to be measured against upon completion of the pond construction. The engineer must specify criteria for acceptance testing of the pond over a specified period of time, using actual daily water level measurements, actual daily precipitation data, and other required data to determine whether the pond is losing water in excess of anticipated losses.

One reason the permanent pool may stabilize lower than the design level is if development in the contributing watershed is phased in over a long period of time, such that the impervious cover and runoff coefficient at the early phases of construction are less than the final, build-out values. In this case the amount of water available to fill the wet pond may be lower at the earlier development phase, which would strand the vegetated bench below the permanent pool level, an unacceptable situation. The designer and Contractor must ensure that the vegetated bench is submerged per the above criteria for wetland plant survival and to maintain liner integrity. It is unacceptable for the water level to remain low for an extended period of time, such that the health of the wetlands plants is threatened due to lack of moisture.

L. GEOMEMBRANES AND GCL'S

1. The geomembrane or GCL shall only be placed on prepared [subgrade/clay liner/geonet composite]. The deployment (including equipment used in the handling of the geomembrane or GCL) shall not damage the sub-liner.
2. No vehicular traffic shall be allowed on the geomembrane or GCL. Only low-ground-pressure supporting equipment may be allowed to traverse across the geomembrane or GCL. If such supporting equipment is operating on the geomembrane or GCL it must be placed on a sacrificial surface or rub sheet in order to help protect the geomembrane liner or GCL.
3. Only those geomembrane liner sections that are to be placed and seamed (or overlapped for GCL's) in 1 day should be unrolled.
4. No equipment or tools shall damage the geomembrane or GCL by handling, trafficking, or other means.
5. No personnel working on the geomembrane or GCL shall smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane.
6. Wrinkles for geomembrane shall be identified as to proper location and compensation shall be identified on the Contractor's and Engineer's drawings. Ballast shall be used to prevent relocation of the compensating wrinkles by wind. [Applicable for exposed liner systems only.]
7. Adequate loading (e.g. sand bags or similar items that will not damage the geomembrane or GCL) shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of

panels to minimize risk of wind flow under the panels).

8. Weather Conditions: Geomembrane or GCL deployment shall proceed between ambient temperatures of 40 F to 104 F. Placement can proceed below 40 F only after it has been verified by the Engineer that the material can be seamed according to the Specifications and is approved by the Engineer. Geomembrane or GCL placement shall not be done during any precipitation, in the presence of excessive moisture (e.g. fog, rain, dew) or in the presence of excessive winds, as determined by the installation supervisor.

M. SEDIMENTATION BASINS, FILTRATION BASINS AND RETENTION PONDS LESS THAN 1,000 SQUARE FEET IN AREA

Concrete liners may be used for sedimentation basins, filtration basins and retention ponds less than one thousand (1,000) square feet in area. Concrete must be five (5) inch thick with a 28 day minimum strength of 3000 psi and a 7 day minimum strength of 2100 psi or better and must be reinforced by steel wire mesh. The steel wire mesh must be six (6) gauge wire or larger and six (6) inch by six (6) inch mesh or smaller. Concrete surface finish must comply with Standard Specification 2201.3.H. When the underlying soil is clay or has an unconfined compressive strength of one-quarter (0.25) ton per square foot or less, the concrete must have a minimum six (6) inch compacted aggregate base consisting of coarse sand and river stone, crushed stone or equivalent with diameter of three-quarters (0.75) to one (1) inch. Where visible, the concrete must be inspected annually and all cracks must be sealed.

2106.4

CONSTRUCTION

A. INSPECTION

All HDPE geomembrane liners or GCL's shall be inspected by the Engineer prior to installation in the Project. Damaged or unsuitable products shall be removed promptly from the job site and replaced with new, undamaged and suitable products. GCL's shall be installed in accordance with the manufacturer's recommendations depending on the type of GCL. The following paragraphs apply to HDPE geomembrane installation.

B. FIELD SEAMING

1. Seams shall be oriented parallel to the line of maximum slope, i.e., oriented down, not across the slope. In corners and odd-shaped geometric locations, the number of field seams shall be minimized, and outside the corners.
2. Seam jointing of the sidewalls and bottom sections must be located in the bottom and at least 5 feet from the sidewall. No folds, large wrinkles, or fish-mouths shall be allowed in the seamed area. Where wrinkles or folds occur, the materials shall be cut and overlapped, and an extrusion weld applied. During wrinkle or fold repairs, adjacent geomembranes may not necessarily be required to meet the 3- to 4-inch minimum overlap if approved by the Engineer. All complete seams shall be tightly bonded and sealed.

C. SEAM OVERLAP

1. Panels of geomembrane must have a finished overlap of a minimum of 4 inches for hot shoe fusion welding and 3 inches for extrusion welding, but in any event sufficient overlap shall be provided to allow

peel tests to be performed on the seam.

2. No solvent or adhesive may be used unless the product is approved by the Engineer.
3. The procedure used to temporarily bond adjacent panels together shall not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any spot welding apparatus shall be controlled such that the geomembrane is not damaged.

D. SEAMING EQUIPMENT AND ACCESSORIES

Equipment for field seaming is hot shoe fusion welders and extrusion welders in accordance with manufacturer's guidelines.

E. TRIAL SEAMS

1. The Engineer should observe all test seam procedures and all seam testing. All seam testing of the geomembrane should follow these specifications.
2. Each day, prior to commencing field seaming, test seams shall be made on fragment pieces of geomembrane to verify that seaming conditions are adequate.
3. Each trial test seam shall be at least 3 feet long by 1 foot wide. Four (six when possible if using dual track fusion welding) adjoining 1-inch wide specimens will be die-cut from the test seam sample. Two specimens will be tested in the field for shear and two for peel (four when possible if testing both inner and outer welds for dual track fusion welding).
4. The failure criteria are the same as that for destructive seam testing as described in Section 7103.7, Destructive Seam Testing, of this Section. These test specimens must exhibit a Film Tear Bond "FTB" (ASTM D6392). If the seam does not delaminate, but fails in the adjacent sheet material on either side of the seam, it is an FTB or an acceptable failure mode. If one test seam fails, the trial seam will be repeated. If this trial seam also fails, then two more trial seams must be constructed and tested. This process must continue and no welding can begin for the machine or welder (if applicable) until all test seams are passing.
5. Additional trial seams shall be made for all of the following:
 - (a) At the beginning of each seaming period for each seaming apparatus used that day (The beginning of each seaming period is considered to be the morning, and immediately after a break).
 - (b) Each occurrence of significantly different environmental conditions (i.e., temperature, humidity, dust, etc.).
 - (c) Any time the machine is turned off for more than thirty minutes.
 - (d) When seaming different geomembranes (tie-ins and smooth to textured).
6. Both the welder and the machine must be tested for each new trial seam when extrusion welding. Only the machine needs to be tested for each new trial seam when fusion welding since the machine is not as operator dependent. Each welder shall make at least one test seam each day he/she actually performs seaming.

F. NON-DESTRUCTIVE SEAM TESTING

The installer shall non-destructively test all field seams over their full length. All test equipment, including but not limited to the following shall be furnished by the installer:

1. Vacuum Box Testing (ASTM D5820):
 - (a) A suction value of approximately 3 to 5 inches of gauge vacuum must be applied to all extrusion welded seams tested in this manner.
 - (b) Equipment for testing single wedge fusion seams and extrusion seams shall be comprised of the following:
 - A vacuum box assembly consisting of: rigid housing, transparent viewing window, soft rubber gasket attached to the bottom, port hole or valve assembly, and vacuum gauge.
 - A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
 - A rubber pressure/vacuum hose with fittings and connections.
 - A plastic bucket and wide paint brush.
 - A soapy solution.
2. The following procedures shall be followed by the installer:
 - (a) Excess sheet overlap shall be trimmed away.
 - (b) Clean the window and gasket surfaces and check for leaks.
 - (c) Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
 - (d) Wet a strip of geomembrane approximately 12 by 48 inches (length of box) with the soapy solution.
 - (e) Place the box over the wetted area and compress.
 - (f) Close the bleed valve and open the vacuum valve.
 - (g) Ensure that a leak tight seal is created.
 - (h) For a period of approximately 15 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
 - (i) If no bubbles appear after 15 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3-inch overlap and repeat the process. The Engineer must observe 100 percent of this testing.
 - (j) All areas where soap bubbles appear shall be marked and repaired and then retested.
3. The following procedures shall apply to locations where seams cannot be non-destructively tested, as determined by the Engineer:
 - (a) If the seam is accessible to testing equipment prior to final installation, the seam shall be non-destructively tested prior to final installation.
 - (b) If the seam cannot be tested prior to final installation, the

seaming operations shall be observed by the Engineer for uniformity and completeness.

4. Air Pressure Testing (ASTM D5820):
 - (a) The following procedures are applicable to those processes which produce a double seam with an enclosed space.
 - (b) Equipment for testing double fusion seams shall be comprised of the following:
 - An air pump equipped with pressure gauge capable of generating and sustaining a pressure of approximately 30 psi and mounted on a cushion to protect the geomembrane.
 - A manometer equipped with a sharp hollow needle, or other approved pressure feed device.
5. The following procedures shall be followed by the installer:
 - (a) Seal both ends of the seam to be tested.
 - (b) Insert needle or other approved pressure device into the tunnel created by the double wedge fusion weld.
 - (c) Energize the air pump to a pressure of approximately 30 psi, if possible. The air pump must then be shut off and the air pressure observed after 5 minutes.
 - (d) A loss of less than 4 psi is acceptable if it is determined that the air channel is not blocked between the sealed ends. A loss of more than 4 psi indicates the presence of a seam leak which must then be isolated and repaired by following appropriate repair procedures. The Engineer must observe and record all pressure gauge readings.
 - (e) Remove needle or other approved pressure feed device and seal.

G. DESTRUCTIVE SEAM TESTING

The installer shall provide the Engineer with a minimum of one destructive test sample per 500 feet of seam length from a location specified by the Engineer. The installer shall not be informed in advance of the sample location. At a minimum, a destructive test must be performed for each welding machine used for seaming or repairs.

1. Sample Procedure: In order to obtain test results prior to completion of liner installation, samples shall be cut by the installer as the seaming progresses. Sampling items and locations shall be determined by the Engineer. The Engineer must witness the obtainment of all field test samples and the installer shall mark all samples with their location roll and seam number. The installer shall also record in written form the date, time, location, roll seam number, ambient temperatures, and pass or fail description. A copy of the information must be attached to each sample portion. All holes in the geomembrane resulting from obtaining the seam samples shall be immediately repaired. All patches shall be vacuum tested.
2. Size and Disposition of Samples: The samples shall be 12 inches wide by 24 inches long with the seam centered lengthwise. The sample shall be cut into two equal length pieces, half to be given to the Engineer and

the other half to be given to the Owner's representative. If the installer desires a sample the size should be increased to 12 inches wide by 36 inches long.

3. Field Laboratory Testing: The Engineer shall cut ten 1-inch wide replicate specimens from his sample and these shall be tested by the Engineer. The Engineer shall test at least two specimens for peel strength (ASTM D4437). To be acceptable, all test specimens must pass the minimum specified value (and exhibit an FTB failure).
4. Independent Laboratory Testing: The Engineer shall witness all field tests and see that proper identification and details accompany the test results. Details required include:
 - (a) Date and time.
 - (b) Ambient temperature.
 - (c) Identification of seaming unit, group or machine.
 - (d) Name of master seamer.
 - (e) Welding apparatus temperature and pressure.
5. Pass or fail description. The Engineer shall properly mark, package and ship at least five specimens received from the installer to a laboratory for the determination of shear and peel strengths (ten when possible for both tracks of dual-track fusion welded seams). The test method and procedures to be used by the independent laboratory shall be the same used in field testing, where seam samples are 1 inch wide, and the grip separation rate is 2 ipm. All specimens tested in the peel mode must fail in FTB. At least four of five specimens from each peel and shear determination must meet the minimum specified value. The average value from all five specimens from each peel and shear determination must meet the minimum specified value.
6. Procedures for Destructive Test Failure: The following procedures shall apply whenever a sample fails the field destructive test:
 - (a) The installer shall reconstruct the seam between the failed location and any passed test location.
 - (b) Additional samples shall be taken 10 feet on either side of the failed test for an additional field test. Should the sample pass the field test, duplicate samples shall be submitted for laboratory testing. If these laboratory samples pass the tests, then the seam is reconstructed between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed.
 - (c) A maximum of two attempts will be made per 100 linear feet of seam before the section is determined failed and repair is to be affixed to the entire seam.
 - (d) Over the length of seam failure, the Contractor shall either cut out the old seam, reposition the panel and reseam, or add a cap strip, as required by the Engineer.
 - (e) After reseaming or placement of the cap strip, additional destructive field test(s) shall be taken within the reseamed area. The reseamed sample shall be found acceptable if test results

are approved by the Engineer. If test results are not acceptable, this process shall be repeated until the resealed length is judged satisfactory by the Engineer.

7. In the event that a sample fails a laboratory destructive test, then the above procedures shall be followed, considering laboratory tests exclusively.
8. The Engineer will document all actions taken in conjunction with destructive test failures.

H. DEFECTS AND REPAIRS

1. All seams and non-seam areas of the geomembrane shall be inspected by the Engineer for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface shall be brushed, blown, or washed by the installer if the amount of dust or mud inhibits inspection. The Engineer shall decide if cleaning of the geomembrane is needed to facilitate inspection.
 - (a) Evaluation:
 - Each suspect location in seam and non- seam areas shall be non-destructively tested as appropriate in the presence of the Engineer. Each location that fails the non- destructive testing shall be marked by the Engineer, and repaired accordingly.
 - (b) Repair Procedures:
 - Defective seams shall be restarted/resealed as described in these specifications.
 - All holes shall be patched.
 - Tears shall be repaired by patching. Where the seam is on a slope or an area of stress and has a sharp end, it must be rounded prior to patching.
 - Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches.
 - Surfaces of HDPE which are to be patched shall be abraded and cleaned no more than 15 minutes prior to the repair. No more than 10 percent of the thickness shall be removed.
2. Patches shall be round or oval in shape, made of the same geomembrane, and extend a minimum of 6 inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement of the geomembrane. Patches shall be applied using approved methods only.
3. Restart/Reseaming for Extrusion Welding Procedures: The welding process shall restart by grinding the existing seam and rewelding a new seam. Welding shall commence where the grinding started and must overlap the previous seam by at least 2 inches. Reseaming over an existing seam without regrinding shall not be permitted.
4. Verification of Repairs:
 - (a) Each repair shall be non-destructively tested except when the Engineer requires a destructive seam sample obtained from a

repaired seam. Repairs that pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

- (b) Daily documentation of all non-destructive and destructive testing shall be provided to the Engineer by the installer. The documentation shall identify all seams that initially failed the test and include evidence that these seams were repaired and successfully retested.

- 5. Geomembrane Acceptance: The installer shall retain all ownership and responsibility for the geomembrane until acceptance by the Owner. The geomembrane liner shall be accepted by the Owner when all of the following conditions are met:

- (a) Installation is finished.
- (b) Verification of the adequacy of all field seams and repairs, including associated testing, is complete.
- (c) Certification, including "as-built" drawing(s), is provided by the installer to the City's representative.

I. PRE-CONSTRUCTION REQUIREMENTS (CLAY LINER)

Before construction when using a clay liner, classify and test all liner material and submit the following with the industrial wastewater treatment permit application:

- 1. Soil classification name(s) for all soils used to construct the surface impoundment and a list of source(s) of any imported soil;
- 2. Particle size distribution, Atterberg limits, and shrink/swell potential, according to ASTM test methods;
- 3. Compaction curves indicating the moisture/density relationship with saturated hydraulic conductivity for a practical range of density and moisture values;
- 4. Optimum moisture content of the soil at various compaction densities; and
- 5. Saturated hydraulic conductivity of a representative compacted sample using water and actual or synthetic wastewater.

J. CONSTRUCTION REQUIREMENTS (CLAY LINER)

Clay liner systems should be constructed:

- 1. With a water content-density range to assure a maximum saturated hydraulic conductivity of 1×10^{-7} cm/sec, verified by an independent soil testing laboratory;
- 2. In lifts that are not more than nine inches thick uncompacted, and six inches thick compacted. Examine each lift before compaction and remove rocks, debris, or foreign matter greater than one inch in diameter. Also remove and repair lenses, cracks, channels and root holes that could adversely affect hydraulic conductivity;
- 3. With bottom seal and dike cores relatively incompressible and compacted at a water content up to 4 percent above the optimum and to at least 90% Standard Proctor Density.

4. By scarring the soils between lifts for good bonding;
5. By performing one test per lift per 3,000 square feet or a minimum two tests per lift to monitor the lift thickness, the water content, the compaction density and the saturated hydraulic conductivity of the liner;
6. At least two feet thick with at least four lifts. Depending on the wastewater class, impoundment purpose, groundwater depth, and other criteria, the Oklahoma Department of Environmental Quality may require a thicker liner.
7. By protecting the soil liner from cracking during and after construction due to desiccation or freezing, and document the procedures; and
8. By protecting the liner with at least 12 inches of soil.

K. **PRE-CONSTRUCTION REQUIREMENTS (CONCRETE LINER)**

Before construction when using a concrete liner, classify and test all liner material and submit the following with the industrial wastewater treatment permit application:

1. Test the concrete liner material for both chemical and physical properties that show the concrete is compatible with the wastewater by using actual or synthetic wastewater; and
2. Determine an appropriate water-cement ratio based on maximum strength requirements and operational conditions.

L. **CONSTRUCTION REQUIREMENTS (CONCRETE LINER)**

Construct a concrete liner as follows:

1. Prepare the subgrade to prevent differential settling under maximum operational conditions;
2. Mix the concrete with water free of oil, grease, acids and alkalis, and under 2000 ppm turbidity with minimal sulfates;
3. Pour concrete liners monolithically, at least six inches thick and reinforced for impoundment stability and to prevent cracking or fracturing during maximum operating conditions; and
4. Construct concrete liners with 3000 pounds per square inch compressive strength concrete as determined after 28 days curing time by standard concrete compression test.

M. **WATER LEVEL MONITORING FOR LINER INTEGRITY VERIFICATION IN WET PONDS**

After the filling and installation of aquatic vegetation in a wet pond, the water level of the permanent pool shall be measured monitored for a minimum of eight weeks. The engineer Cishall specify the method and frequency of monitoring, and the responsible party for conducting water level monitoring. The engineer shall perform a water balance, as specified in EDC 7004.3.C.3, to determine that the water loss does not exceed anticipated losses from calculated liner leakage, evaporation, plant transpiration and discharge. All monitoring data and calculations must be documented and submitted to the City of Norman for review

2107 MEASUREMENT AND PAYMENT

2107.1 *SCOPE*

This section covers the methods of measurement, and the basis of payment, for the furnishing of all labor, equipment, tools and materials, and for the performance of all related work necessary to complete any construction covered in Section 2100.

2107.2 *GENERAL*

Unless specifically altered by the contract Special Conditions, the methods of measurement and payment will be specified herein.

2107.3 *ITEMS NOT LISTED IN THE PROPOSAL*

There will be no measurement or separate payment for any items of work not specifically identified and listed in the Proposal and all costs pertaining thereto will be included in the contract unit prices for other items listed in the Proposal.

2107.4 *MEASUREMENT AND PAYMENT*

Payment for the quantities of accepted work will be made as follows:

- A. **Site Clearing:** Site clearing, right-of-way clearing, and site restoration for pipelines shall all be paid for at the lump sum price provided in the proposal. The contract lump sum price shall be the total compensation for furnishing all material, labor, equipment, tools and incidentals necessary to complete the work, in accordance with the plans and these specifications. When not listed as a separate contract pay item, site clearing and right-of-way clearing and restoring shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided for in the proposal contract.
- B. **Excavation:** All authorized excavation shall be measured, unless lump sum method is included in the proposal, in its original position and the volume in cubic yards determined by the average end area method. All work performed as prescribed by this item shall be paid for at the contract bid price per cubic yard or lump sum for unclassified excavation, or rock excavation, which price shall constitute payment in full for excavation, placing excavated material in embankment, loading and hauling, and for satisfactory disposal of unsuitable and excess materials; finishing slopes, ditches and parkways; for all maintenance blading or scarifying the ground surface; and for furnishing all labor, tools, materials, equipment, and incidentals necessary to complete the work. Dragging, pushing, or scraping of material along or across the surface of the complete concrete improvements or pavements shall not be permitted.
- C. **Borrow:** Borrow shall be measured in a compacted condition in its final position and the volume computed in cubic yards by the method of average end areas; or as specified otherwise. All work performed as required herein and as "Embankment," and measured as provided in this item shall be paid for at the unit price bid. The unit price bid shall be full compensation for furnishing all labor, for all royalties, materials, tools, equipment, hauling and incidentals necessary to complete the work.
- D. **Embankment:** Embankment shall not be measured or paid for as a separate contract pay item, but the cost of construction of the embankment complete in place shall be included in such contract pay items as "Excavation" or "Borrow." The contract pay items provided shall be full compensation for the furnishing of all labor, material, tools, equipment, and incidentals necessary to complete the embankment, including cost of water, sprinkling or wetting, rolling, etc., in accordance with the plans and specifications.

E. **Topsoil:**

1. Topsoil secured from borrow sources shall be measured by the square meter (square yard) in place on the project site. Measurement for payment shall be made only on topsoils secured from borrow sources. All work performed as ordered and measured as provided under this item shall be paid for at the unit price bid for topsoil. The price shall be full compensation for excavating, loading, hauling, placing, and furnishing all labor, equipment, tools, supplies and incidentals necessary to complete the work.
2. All labor, equipment, tools, and incidentals necessary to place salvage topsoil as specified shall be included in the unit price bid for "Unclassified Excavation." All excavation required by this item in cut sections shall be measured in accordance with provisions for the various excavation items involved with the provision that excavation shall be measured and paid for once only, regardless of the manipulations involved.

F. **Sodding:** Spot sodding and block sodding shall be measured and paid for at the unit price per square yards of sodded area complete in place in accordance with the plans and specifications. The contract unit price shall be the total compensation for furnishing and placing all sod; for all rolling and tamping; for all water; for disposal of all surplus material; and for all material, labor, equipment, tools and incidentals necessary to complete the work, all in accordance with the plans and these specifications.

G. **Seeding:** Acceptable material for broadcast seeding, disked seeding, asphalt mulch seeding, and hydro mulching shall be measured and paid for at the unit price per square yard or by the acre, complete in place. The price shall be full compensation for furnishing of all materials, including water, for seed-fertilizer slurry, hydraulic mulching, and sprinkling; and for performing all operations necessary to complete the work except as follows: all fertilizer shall be measured and paid for separately.

H. **Fertilizer:** Fertilizer shall be considered as incidental work, and the cost thereof shall be included in such contract pay items as are provided for in the proposal contract.

I. **Temporary Erosion and Sediment Control:**

1. Temporary erosion, sediment, and water pollution control measures installed according to the specifications as required for earthwork, clearing, and grading, not attributed to the Contractor's negligence, shall be measured and paid for in accordance with appropriate specifications for the type of control measure installed, or by a lump sum for the entire item of work. Should the work not be comparable to the work included under the applicable bid items, the work will be paid for as "Extra Work" in accordance with Section 1104.5 of the General Conditions. Unit contract price paid shall be full compensation for all materials, labor, equipment, and incidentals to complete the work as specified.
 - (a) Temporary Slope Drains: Slope drains will be measured and paid for by the linear foot in place. Measurements will be taken only on the completed cut or fill slope when to grade. Inlets, outlets, and diversion dikes will be considered as an integral part of the drain.
 - (b) Temporary Siltation Screen: Siltation screens approved by the Engineer will be measured and paid for by the linear foot in place.
 - (c) Temporary Sediment Filter: Sediment filters will be measured and paid for by each unit accepted in place.
 - (d) Temporary Sediment Basin: Accepted sediment basins will be measured and paid for by each unit constructed as specified. Inlets and outlets will be considered an integral part of the basin.
2. In the event that temporary erosion, sediment, and water pollution control measures required on projects are due to Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer, such work shall not be measured for payment but shall be performed by the Contractor at his own expense.
3. Temporary pollution control may include construction work outside the right-of-way.. Contractor shall perform temporary pollution control work outside the right-of-way as needed without a separate itemization or measurement for payment beyond the proposed project cost.

END OF SECTION 2100

City of Norman

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City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 2200

MISCELLANEOUS CONSTRUCTION

2201 CONCRETE FOR STRUCTURES

2201.1 *GENERAL REQUIREMENTS*

- A. Description: This section shall govern the performance of all work necessary for construction of cast-in-place concrete structures for inlets, manholes, junction boxes, headwalls, and incidental structures.
- B. Responsibility for Strength: It is the intent of these specifications that the Contractor shall guarantee that concrete of the specified compressive strength is incorporated in the structures and that the responsibility for producing the required grades of concrete is assumed by the Contractor. Should the average strengths shown by test cylinders fall below the strengths required, the Engineer will require any or all of the following changes: amount of cement; grading of aggregate, or ratio of the water to the cement used. If the tests disclose that the strength of the concrete is insufficient for the structure as built, the Engineer may condemn the part of any structure in which concrete of insufficient strength has been placed and the Contractor, at his cost, shall remove and replace such concrete with concrete meeting these specifications.

2201.2 *MATERIALS*

- A. Fly Ash: Concrete materials shall conform to ODOT Specification Section 701, except that fly ash shall not be used to replace cement in the mix design.
- B. Concrete Mixes: All concrete shall be in accordance with Sections 509 and 701, of the latest edition of the ODOT "Standard Specifications for Highway Construction."
- C. Reinforcing Steel: Reinforcing bars shall conform to ASTM A615 Grade 60. Welded wire fabric shall conform to ASTM A185.

2201.3 *CONSTRUCTION METHODS*

- A. **Experimental Concrete Mixes:** The Contractor shall make experimental mixes prior to the placing of the concrete and at any time during the progress of the work when necessary to demonstrate that the concrete will meet these specifications. Materials for making experimental mixes shall be furnished by the contractor and these materials shall be identical with those intended for use in the work. The cost of the materials, as well as the costs of crushing test specimens made from the experimental mix, shall be borne by the Contractor and shall be included in the price bid for concrete.
- B. **Mixing:** The concrete shall be mixed in an accepted batch machine or mixer. The ingredients shall be accurately measured by weight, unless measurement by

volume is permitted by the Engineer, before being placed in the mixer. Measuring boxes or other accepted measuring apparatus shall be such that the proportions can be accurately determined. The quantity of water to be added, which will vary with the degree of dryness of the material and with the weather conditions, shall be accurately measured for each batch of concrete. Means shall be provided by which a measured quantity of water can be introduced at any stage of the process. The mixing shall be done in a thorough and satisfactory manner and shall continue until every particle of aggregate is completely covered with mortar. The mixing time for each batch of two yards or less shall be not less than one and one half (1½) minutes after the materials are in the mixer. The mixing time shall be increased fifteen (15) seconds for each additional cubic yard or fraction thereof. The entire contents of the drum shall be discharged before recharging. Re-tamping of concrete which has partly hardened will not be permitted.

- C. **Ready Mixed Concrete:** Ready-mixed concrete may be used on the work, when the mix design is accepted during the submittal process. The contractor must demonstrate that the concrete can be furnished in accordance with these specifications and that delivery can be made at a rate that will ensure the continuity of any pour. All mixer trucks shall be equipped with water meters. Additional water shall be added at the job site only with the specific permission of the Engineer.
- D. **Consistency:** All reinforced concrete which is required to be spaded or puddled in forms or around reinforcing steel shall be of such consistency that:
1. All aggregates will float uniformly throughout the mass without settling or segregation;
 2. When dropped directly from the discharge chute of the mixer, it will flatten out at the center of the pile but will stand up at the edges, the piling spreading from internal expansion and not by flowing;
 3. It will flow sluggishly when tamped or spaded;
 4. It can be readily puddled into corners and angles of forms and around reinforcing steel;
 5. It can be readily spaded to the bottom of the pour or to a depth of several feet at any time within thirty (30) minutes after placing.
 6. A desirable consistency is one which results in a very slight accumulation of water at the top of a layer several feet in thickness, but with out segregation or accumulation of laitance. If, through accident, intention or error in mixing, any concrete shall, in the opinion of the Engineer, very materially from the consistency specified, such concrete shall not be incorporated in the work but shall be discharged as waste material.
- E. **Placing Concrete:** Before beginning a run of concrete, surfaces of the forms, reinforcing steel and concrete previously placed shall be thoroughly wetted or oiled. Sub-grades shall be sprinkled or sealed in a manner that will prevent the removal of water from the concrete.

Concrete shall be placed in the forms immediately after mixing. It shall be so deposited that the aggregates are not separated. Dropping the concrete any considerable distance, generally in excess of 5' depositing large quantities any point and running or working it along the forms, or any other practice tending to cause segregation of the ingredients will not be allowed. It shall be compacted

by vibration or continuous tamping, spading or slicing. Care shall be taken to fill every part of the forms, to work the coarser aggregate back from the face, and to force the concrete under and around the reinforcement without displacing it. All concrete shall be thoroughly vibrated, except where specifically excepted in the specifications. The concrete shall be deposited in continuous horizontal layers and whenever practicable, concrete in structure shall be deposited continuously for each monolithic section of the work. Chutes and tremmies used for conveying concrete shall be mortar-tight. Work shall be arranged in order that each part of the work shall be placed as a unit if this is possible. Where necessary to stop placing concrete, the work shall be brought up in level courses and against a vertical stop board. The placing of concrete under water, where permitted, must be done by special accepted methods. No concrete shall be placed without providing advanced notification to, and receiving acknowledgment from, the Project Inspector.

- F. **Placing Concrete in Cold Weather:** No concrete shall be placed without the specific permission of the Engineer when the air temperature is at or below 35 degrees F. If concreting in freezing weather is permitted by the Engineer, care shall be taken to prevent the use of any frozen material. In addition to adequate provisions for protecting the concrete against chilling or freezing, the Contractor shall heat the water and aggregate in order that when deposited in the forms, the concrete will have a temperature of not less than 55 degrees F, nor more than 70 degrees F. Heated water and aggregate shall be combined in the mixer before cement is added. Cement shall not be added to mixtures of water and aggregate when the temperature of the mixture is greater than 100 degrees F. The concrete shall be adequately protected in order to maintain a minimum concrete temperature of $\square\square$ degrees F for a minimum period of seventy two (72) hours [for "High Early Strength" concrete, a minimum period of forty-eight (48) hours] after it has been placed and a temperature above 32 degrees F for a period of two additional days. The work shall be done entirely at the Contractor's risk; if the concrete is damaged then the Contractor shall replace it. No chemicals or other foreign matter shall be added to the concrete for the purpose of preventing freezing, and concrete shall not be placed on frozen ground.
- G. **Construction Joints:** Construction joints shall be located as shown on the plans and at other points as may be necessary during construction provided that the location and nature of additional joints shall be accepted by the Engineer. In general, joints shall be located at points of minimum shear, shall be perpendicular to the principal lines of stress, and shall have suitable keys having areas of approximately one-third ($1/3$) of the area of the joints. When placing against a construction joint, the surface of the concrete previously placed shall be thoroughly cleaned of dirt, scum, laitance or other soft material, and shall be roughened. The surface shall then be thoroughly washed with clean water and covered with at least $1/2$ " of cement mortar, after which concreting may proceed. Mortar shall be placed in a manner that will not splatter forms and reinforcing steel.
- H. **Finish of Concrete Surfaces:** All surfaces exposed to view shall be free from conspicuous lines, affects or other irregularities caused by defects in the forms. If for any reason this requirement is not met, or if there are any conspicuous honeycombs, the Engineer may require a correction of the defects by rubbing with carborundum bricks and water until a satisfactory finish is obtained. Immediately after removing the forms, all wires or other exposed metal shall be cut back off the concrete surface and the depressions thus made and all honeycombing and other defects shall be painted with mortar and then rubbed

smooth. If the Engineer deems any honeycombing or other defect to require such treatment, the defective concrete shall be cut out to a depth sufficient to expose the reinforcement and to afford a key for the concrete replacing the cut out.

- I. **Curing Concrete:** Exposed surfaces of concrete shall be protected by accepted methods from premature drying for a period of at least seven (7) days. Curing compounds, when accepted by the Engineer, shall be applied according to the manufacturer's recommendations and shall not be used on any surface against which additional concrete is to be bonded, nor on surfaces which will be painted. In dry, hot weather, forms shall be removed as early as practicable and curing started immediately. The Engineer may require the frequent wetting of the concrete and the use of means to protect it from the direct rays of the sun.
- J. **Placing Reinforcement:** All reinforcement, when placed, shall be free from mill scale, loose or thick rust, dirt, paint, oil or grease, and shall present a clean surface. Bends and splices shall be accurately and neatly done, and shall conform to the American Concrete Institute Manual of Standard Practice for Detailing Reinforced Concrete Structures. All reinforcing shall be placed in the exact position shown on the plans and shall be held firmly in position by means of accepted spacers and supports, by wiring to the forms, and by wiring the bars together at intersections with accepted wire ties in order that the reinforcement will not be displaced during the depositing and compacting of the concrete. When the concrete surface will be exposed to the weather in the finished structure or where rust would impair the appearance, the portions of all accessories in contact with the form work shall be galvanized steel or plastic. The placing and fastening of reinforcement in each section of the work shall be accepted by the Engineer before any concrete is deposited in the section. Care shall be taken not to disturb the reinforcement after the concrete has taken its initial set.
- K. **Forms:** Forms shall be so designed and constructed that they may be removed without injuring the concrete. The material to be used in the forms for exposed surfaces shall be sized and dressed lumber or metal in which all bolt and rivet heads are countersunk. In either case, a plain, smooth surface of the desired contour must be obtained. Undressed lumber may be used for backing or other unexposed surfaces, except inside faces of conduits. The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar tight and, if necessary to close cracks due to shrinkage, shall be thoroughly soaked in water. Forms for re-entrant angles shall be filleted and for corners shall be chamfered. Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed. The interior surfaces of the forms shall be adequately oiled with a non-staining mineral oil to ensure the non-adhesion of mortar. Form lumber which is to be used a second time shall be free from bulge or warp and shall be thoroughly cleaned. The forms shall be inspected immediately preceding the placing of concrete; any building or warping shall be remedied and all dirt, sawdust, shavings or other debris within the form shall be removed. No wood device of any kind used to separate forms will be permitted to remain in the finished work. Temporary openings shall be placed at the bottom of the column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.
- L. **Removal of Forms:** Forms shall be removed in such manner as to ensure the complete safety of the structure. No forms shall be removed except with the express permission of the Engineer. In general, acceptance will be based on

the following:

1. Forms on ornamental work, railings, parapets and vertical surfaces which do not carry loads and which will be exposed in the finished work shall be removed within twenty-four (24) hours to forty-eight (48) hours after placing, depending upon weather conditions.
2. Girder, beam and joist sides only, column, pier, abutment and wall forms may be removed within twenty-four (24) hours to forty-eight (48) hours after placing, depending upon weather conditions. No backfill shall be placed against wall, piers or abutments unless they are adequately supported or have reached the required strength.
3. Girder, beam and joint soffit forms shall remain in place with adequate shoring underneath, and no construction load shall be supported upon nor any shoring removed from any part of the structure under construction until that portion of the structure has attained sufficient strength to support safely its weight and the loads placed thereon.
4. *Concrete Thrust Blocks:* Thrust blocks or other restraint devices shall be adequate to prevent movement of the line at 150 psipressure, unless otherwise specified. Thrust blocks shall be placed against undisturbed soil in the trench. The thrust block shall have sufficient surface area to transmit the thrust to the undisturbed soil. The thickness, width, and length shall be sufficient to carry the required load. The minimum thickness, width, and length for thrust blocks shall be 12". Concrete placed for thrust blocks shall be consolidated to ensure that no voids remain in the block. Thrust blocks will be of unreinforced 3500 psi concrete unless otherwise specified.

M. Concrete Encasement of Pipelines:

1. *General:* Concrete encasement of pipelines shall be a minimum of 6" thick at the thinnest point. Encasement shall be plain concrete with no reinforcement, unless otherwise specified. All encasement will be placed as a monolithic placement.
2. *Water Lines:* Water lines shall be encased where the cover over the line is not sufficient to spread surface loading where trench widths are more than the maximum as shown on the Standard Details.
3. *Sanitary Sewer Lines:* Sanitary sewers shall be encased when the depth of cut from the original ground elevation to the flow line of the pipe is 4' or less. Sanitary sewer lines will be encased where they cross water lines, as shown on the plans. Flowable fill encasement necessitated by trench widths more than the maximum as shown on the Standard Details shall be placed as directed by the Engineer. All flowable fill encasement required because of excessive trench width shall be placed at the expense of the contractor.
4. *Other Utility Lines:* Where other utility lines require concrete encasement, the owner of the utility shall specify the method and thickness of encasement.

- N. **Concrete Slab Protection for Pipelines:** This item will be installed only as shown on the plans or at the direction of the Engineer. Where pipelines are within 24" of the surface or 24" of another pipeline, they will be covered with a 12" reinforced concrete slab. This slab will be placed in such a manner as to prevent accidental excavation into the pipeline. This slab shall be placed on a (2" thick rock bed over the pipeline. The excavation shall then be filled to ground level.
- O. **Concrete Cradle for Pipelines:** Concrete cradle of pipelines shall be a minimum of 6 inches thick at the thinnest point on the sides and bottom of the pipe. Cradle shall be plain concrete with no reinforcement, unless otherwise specified. All cradle will be placed as a monolithic placement. For sanitary sewers, a standard concrete cradle is required at any location where the depth of cut to the flow line of the pipe is 16' or more. Concrete cradle necessitated by trench width more than the maximum as shown on the Standard Details shall be placed as directed by the Engineer. All concrete cradle required because of excessive trench width shall be placed at the expense of the contractor.
- P. **Reinforced Concrete Piers for Pipelines:** Piers shall be located and constructed as shown on the plans and Standard Details. Forms shall be made to conform to the shape of the pier and securely braced. Reinforcing steel shall be bent as detailed and securely tied in place. Bearing area for the pipe shall be made to fit the outside diameter of the pipe and shall support the pipe at the proper grade. Steel strapping and bolts shall be galvanized or stainless with a neoprene or felt bond breaker between the steel casing and the straps. Any honeycomb or other unevenness in the concrete shall be patched with cement mortar immediately after form removal.

2202 BORE AND CONDUIT

2202.1 DESCRIPTION

This section governs the furnishing of all materials, labor, equipment, tools and other services to construct conduit (casing) pipes beneath streets, highways, and railroads and perform related work necessary to complete the work shown on the plans or specified.

2202.2 PERMITS

The permits for crossings shall be obtained by the City of Norman. The Contractor shall give notification to the Oklahoma Department of Transportation (ODOT) or railroad company prior to the start of the work. Work shall not commence until all arrangements are completed and permission is given by the City to start the work. For development projects, all required information and fees for permitting shall be submitted by the Developer.

2202.3 SUBMITTALS

Submittals shall be as specified in the General Conditions.

- A. Submit the following:
 1. Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards.
 2. Certified copies of reports of factory tests specified in this Section and required by the referenced standards.
 3. Plans and details describing materials and methods proposed by the Contractor for use in special crossings.

4. Detailed design calculations and drawings of support systems proposed for tunnel construction.

2202.4

GENERAL PROCEDURES

- A. The Contractor shall be prepared to attend all meetings and provide any necessary data, reports, information, details, and construction schedules as requested by the Owner.
- B. The Engineer shall review and modify as necessary the scheduling of any or all construction activities under the highway or railroad right-of-way in order to prevent interruption to traffic. The Contractor shall include the cost for such procedures in his bid and shall not be entitled to any change in contract amount on account of such procedures.
- C. All work shall be done in a careful, workmanlike manner to the satisfaction of the proper officials, as well as the Engineer.

2202.5

PRODUCTS

- A. Steel Conduit
 1. The conduit pipe and joints shall be of steel construction. The conduit pipe and joints shall be capable of withstanding the load of railroad roadbed, track, and traffic or the load of pavement, subgrade, and traffic, as applicable. The conduit pipe and joints shall be constructed to prevent leakage of any matter from the conduit throughout its entire length, except at the ends of the conduit.
 2. The conduit pipe shall be welded steel pipe, new and unused material in accordance with current ASTM Specifications A-139 Grade B for "Electric Fusion of Welded Steel Pipe" with a minimum yield of 35,000 psi. The inside diameter shall be at least 4" greater than the largest diameter of the carrier pipe's main joint or exterior restrained joint, whichever is greater.
 3. The minimum wall thickness of the conduit pipe shall be as shown in the following table:

<i>Diameter of Casing</i>	<i>Minimum Wall Thickness</i>	
	<i>Under Highway</i>	<i>Under Railroad</i>
<i>in.</i>	<i>in.</i>	<i>in.</i>
Under 14	0.25	0.188
14	0.25	0.219
16	0.25	0.219
18	0.25	0.25
20	0.375	0.281
22	0.375	0.312
24	0.375	0.344
26	0.375	0.375
28	0.5	0.406

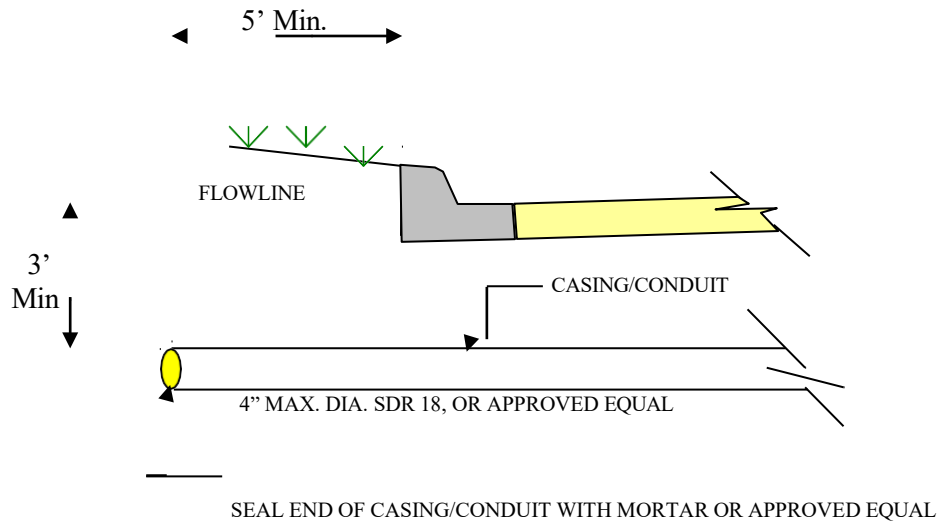
<i>Diameter of Casing</i>	<i>Minimum Wall Thickness</i>	
	<i>Under Highway</i>	<i>Under Railroad</i>
<i>in.</i>	<i>in.</i>	<i>in.</i>
30	0.5	0.406
32	0.5	0.438
34	0.5	0.469
36	0.5	0.469
38	0.5	0.5
40	0.5	0.5
42	0.5	0.5

4. The exterior walls of conduit shall be treated on a tiered system as indicated below:
- Tier 1 (non-critical crossings of minor roadways and drainage channels) – casing pipe without an epoxy coating.
 - Tier 2 (critical crossings of major roadways and highways) – casing pipe with exterior walls fusion bonded epoxy coated in accordance with AWWA C213 or approved equal.
 - Tier 3 (railroad crossings) – casing pipe with exterior walls fusion bonded epoxy coated in accordance with AWWA C213 or approved equal. Additionally, conduit under railroads shall have a compatible abrasion resistant overlay with a minimum 20 mil thickness. Abrasion resistant overlay shall be applied over the fusion bonded epoxy coating. After conduit is welded, exterior coating shall be repaired in accordance with AWWA C210 or approved equal.

B. Plastic Conduit

- Utility boring casing 4 inches or less in diameter in public Rights-of-Way, may consist of PVC, SDR 18, or equal and be at least 3 feet below gutter. The colors of plastic casings shall be consistent with standard color convention for buried utilities:
 - Red or red stripes: Electric lines
 - Orange or orange stripes: Telecommunications or alarm lines
 - Yellow or yellow stripes: Natural gas and petroleum
 - Green or green stripes: Sewer lines
 - Blue or blue stripes: Potable Water
- If the annular space between the surrounding soil and the outside of the casing or conduit exceeds $\frac{1}{2}$ " at any point, then said space must be pressure grouted.
- The conduit pipe and joints shall be constructed to prevent leakage of any matter from the conduit throughout its entire length.

Figure 2200 – 1



SECTION AT EDGE OF ROADWAY

2202.6

CONSTRUCTION OF CONDUIT PIPE

- A. Installation of the conduit shall proceed from a pit, be excavated at a safe distance from the edge of the highway or railroad and outside of the right-of-way unless approved by the Engineer for construction within the right-of-way, and shall be constructed without interruption to highway or railroad traffic.
- B. The carrier pipe shall be installed inside a conduit pipe of the length shown on the plans. Except as otherwise permitted, the conduit pipe shall be dry bored or jacked into place to satisfactory alignment and grade for its entire length.
- C. The jacking pipe shall be constructed to provide not less than 25' clearance between the side of the pit adjacent to the road and the centerline of the track or road measured at right angles. Open trenches shall be properly sheeted and braced when and where necessary to provide safe working conditions and protection for highway, roads, structures, and utilities.
- D. Provide and maintain during conduit installation and backfill, pits at locations shown on plans or as directed by the Engineer. Excavation for pits shall be sheeted as necessary.
- E. Remove all excavated material and replace or change existing structures or utilities encountered to the satisfaction of the Engineer.
- F. The ends of the conduit shall be filled with concrete mortar to protect against the entrance of foreign material which might prevent ready removal of the conduit.
- G. For street/roadway crossings, minimum clearance between bottom of pavement base and top of conduit shall not be less than 18".

2202.7 CONSTRUCTION OF CASING PIPE BY METHODS OTHER THAN JACKING OR BORING

The installation of the conduit pipe by methods other than the jacking method must be performed in a manner which meets with prior approval of the authorities. Any expense incurred in connection with the construction of the crossing, removal, replacement, or maintenance resulting from the construction of the conduit and carrier pipe shall be at the expense of the Contractor.

2202.8 INSTALLATION OF CARRIER PIPE

- A. The carrier pipe designated on the drawings shall be as specified in other Sections for the type of pipe, whether water main, gravity sanitary sewer, storm sewer, force main, or electrical conduit.
- B. Jointing of the carrier pipe shall be restrained joints for the type of pipe material and fittings used unless a variance from this requirement is approved by the Engineer.
- C. Carrier pipe shall be placed into and through the tunnel liner or steel conduit at locations shown on plans using casing insulators or spacers designed to adequately support and electrically isolate the carrier pipe within the casing pipe under all conditions. Insulators or spacers shall consist of pre-manufactured steel bands with plastic lining and plastic runners. Insulators shall fit snug over the carrier pipe and position the carrier pipe approximately in the center of the casing pipe, to provide adequate clearance between the carrier pipe bell and the casing pipe. Fasteners for insulators shall be stainless steel or cadmium plated. The number and location of casing insulators or spacers shall be determined by the manufacturer to protect carrier pipe from damage. Manufacturers of casign insulators or spacers shall be:
 - Advance Products & Systems, LLC (<http://www.apsonline.com>).
 - Cascade Waterworks Manufacturing Company (<http://www.cascademfg.com>)
 - CCI Piping Systems (<http://www.ccipipe.com>)
 - Approved equal .

Wood skids are not acceptable for this use. Methods of pipe installation shall be used to maintain tight joints, to the satisfaction of the Engineer.

2203 MATERIALS FURNISHED BY CONTRACTOR, INSTALLED BY CITY

2203.1 DESCRIPTION

This specification governs materials to be provided to the City for installation by the City.

2203.2 MATERIALS

Materials shall be provided to the City in accordance with the specifications and as described in the Special Conditions and/or Contract proposal.

2203.3 CONSTRUCTION METHODS

The Contractor will provide materials to be installed by the City to the location specified by the City.

2204 MATERIALS FURNISHED BY CITY, INSTALLED BY CONTRACTOR

2204.1 DESCRIPTION

This specification governs the installation of materials furnished by the City as included in the Contract proposal.

2204.2 MATERIALS

Materials furnished by the City shall be as described in the Special Conditions and/or included in the proposal.

2204.3 CONSTRUCTION METHODS

- A. The City will provide the materials to be installed by the Contractor to the location specified by the Contractor.
- B. Materials shall be installed in accordance with the City's and/or manufacturer's specifications.

2205 PAVEMENT REMOVAL AND REPLACEMENT

2205.1 DESCRIPTION

This section governs all work involved in the repair and replacement of existing streets, roads, highways, drives, parking areas, curbs, gutters, sidewalks, and other paved areas damaged or destroyed during construction of the work included in this Contract.

2205.2 DEFINITIONS

- A. **Abbreviations**
 - 1. *ODOT* - Oklahoma Department of Highways' Standard Specifications.
 - 2. *AASHTO* - American Association of State Highway & Transportation Officials.
 - 3. *ACI* - American Concrete Institute.
 - 4. *ASTM* - American Society for Testing & Materials.
 - 5. *NRMCA* - National Ready Mix Concrete Association.
- B. **Rock:** A natural aggregate of mineral particles connected by strong and permanent cohesive forces. Rock includes limestone, sandstone, dolomite, granite, marble, and lava.
- C. **Subgrade:** The prepared and compacted soil immediately below the pavement or walk system and extending to such depth as will affect the structural design.
- D. **Subbase:** The layer of specified or selected material of designed thickness placed on a subgrade to support a base course and surface course.
- E. **Base Course:** The layer of specified or selected material of designed thickness placed on a subbase to support a binder or surface course.
- F. **Binder Course:** The layer of specified or selected material of designed thickness placed on a base course to support a surface course.
- G. **Surface Course:** The layer of specified or selected material of designed thickness placed on a subbase or base course to support the traffic load.

2205.3

QUALITY ASSURANCE

- A. **Mixing Plant:** Prior to placing any hot asphalt concrete pavement or Portland cement concrete pavement, the Contractor shall provide the Engineer the name and location of the bituminous mixing or concrete mixing plant and the type and composition of mixes the Contractor proposes to use in the work.
- B. **Tolerances:** Paving and surfacing shall comply with the tolerances specified in ODOT Section 401.04.

2205.4

JOB CONDITIONS / CONSTRUCTION METHODS

- A. Paving and surfacing materials shall not be placed on a wet surface or when weather conditions would prevent the proper construction of paving and surfacing.
- B. Aggregate base shall not be placed on frozen subgrade or when air temperature is below 35 degrees F
- C. Bituminous prime coat or tack coat shall not be placed when air temperature is below 50 degrees F
- D. Bituminous mixtures shall be placed in accordance with Section 411.04, of the latest edition of the ODOT “*Standard Specifications for Highway Construction.*” and per the following tables. Bituminous mixtures shall not be placed on any existing concrete or bituminous surface where temperature is 25 degrees F or lower.

COMPACTED LIFT THICKNESS	SURFACE TEMPERATURE (Minimum)
More than 3 inches	40 degrees F
1 ½ inches to 3 inches	45 degrees F
1 ½ inches	50 degrees F

Note: If wind speed is 10 mph or greater, then 5 degrees F will be added to minimum temperature.

Hveem Equivalent Type	Superpave Type	Nominal Size (in.)	Compacted Lift thickness Range (in.)	Optimum Lift Thickness (in.)
*	S1	1-1/2	4-1/2 to 9	6
AH	S2	1	3 to 6	4
A	S3	3/4	2-1/4 to 4-1/2	3
B, BH	S4	1/2	1-1/2 to 3	2
C	S5	3/8	1-1/4 to 2-1/4	1-1/2
D	S6	No. 4	1/2 to 1	3/4

- E. **Placing Concrete in Cold Weather:** No concrete shall be placed without the specific permission of the Engineer when the air temperature is at or below 35

degrees F. If concreting in freezing weather is permitted by the Engineer, care shall be taken to prevent the use of any frozen material. In addition to adequate provisions for protecting the concrete against chilling or freezing, the Contractor shall heat the water and aggregate in order that when deposited in the forms, the concrete will have a temperature of not less than 55 degrees F, nor more than 70 degrees F. Heated water and aggregate shall be combined in the mixer before cement is added. Cement shall not be added to mixtures of water and aggregate when the temperature of the mixture is greater than 100 degrees F. The concrete shall be adequately protected in order to maintain a minimum concrete temperature of 55 degrees F for a minimum period of seventy two (72) hours [for "High Early Strength" concrete, a minimum period of forty-eight (48) hours] after it has been placed and a temperature above 32 degrees F for a period of two additional days. The work shall be done entirely at the Contractor's risk; if the concrete is damaged then the Contractor shall replace it. No chemicals or other foreign matter shall be added to the concrete for the purpose of preventing freezing, and concrete shall not be placed on frozen ground.

- F. Paving and surfacing materials shall not be placed when natural light is not sufficient to properly observe work or operations.

2205.5

MATERIALS

- A. **Aggregate:** Mineral aggregates shall be in accordance with ODOT Sections 701 or 703, , depending on the intended use.
- B. **Bituminous Materials:**
1. *Petroleum asphalt cement:* Petroleum asphalt cement shall be Grade AP-5, AP-4, or AP-3 and shall be homogeneous, free from water, and shall not foam when heated to 347 degrees F.
 2. *Viscosity Asphalt Cement:* Viscosity graded asphalt cement shall meet the requirements of AASHTO M 320 and shall be performance graded asphalt.
 3. *Cut-Back Asphalt:* Cut-back asphalt shall be composed of an intimate homogeneous mixture of an asphalt base and a suitable distillate designed for rapid, medium, or slow curing. Cut-back asphalt may also contain an additive as an aid in uniformly coating wet, damp, or dry aggregates used in patching mixtures or bituminous pavements. The asphalt shall not contain more than 0.5% water as determined by AASHTO T55, shall not separate when allowed to stand, and shall not foam when heated to permissible temperatures. When an additive is used, it shall be incorporated homogeneously in the asphalt at the point of manufacture.
 4. *Prime Coat Materials:* Bituminous materials for prime coat shall conform to ODOT Section 708.03 for Cut-back asphalt - MC-70; or MC-30, or Asphalt emulsion - AE-P, AE-PL
 5. *Tack Coat Materials:* Bituminous materials for tack coat shall conform to ODOT Section 708.03 for Asphalt Emulsion - AE-T, SS1 and CSS1.
 6. *Seal Coat Materials:* Bituminous materials for seal coat shall conform to ODOT section 708.03 for Asphalt Emulsion - RS-2, AE-90, AE-150.
- C. Hot Asphalt Concrete Mixes

1. Hot asphalt concrete (HAC) mixture shall consist of an intimate mixture of coarse aggregate, fine aggregate including mineral filler if required, and asphalt cement combined in portions specified in this Section. The mixture proportions have been prepared on the basis of using rock or gravel aggregate.
2. When the use of one kind and size of aggregate is started, the use of that same kind and size shall be continued for the entire lift being constructed, unless otherwise directed by the Engineer.
3. Hot asphalt concrete mixtures shall comply with the following, unless otherwise shown or specified:

ODOT

<u>Course</u>	<u>Type</u>	<u>Specifications</u>
Base	S3	411 and 708-3
Surface	S4 & S5	411 and 708-3\

D. Portland Cement Concrete

1. *Cement* shall be Portland cement and shall meet the requirements of ASTM Specification C 150, ACI 301, and ACI 318. Cement shall be Type 1 for normal use, Type 1A where air-entrainment is desired, or Type III or Type IIIA where high early strength is desired and authorized by the Engineer. Blended hydraulic cements which meet the requirements of ASTM Specification C 595 Type 1-P Portland-pozzolan cement may be used where a more watertight concrete is required. Cement shall meet the requirements of ODOT Section 414.
2. *Aggregate:* Regular fine and coarse aggregates shall meet the requirements of ASTM Specification C 33. Aggregate shall be crushed limestone with a maximum size of 3/4 inch, except in mass concrete the maximum size may be 1-1/2 inches.
3. *Water* shall be potable, clean, and free from injurious amounts of oils, acids, alkalis, organic materials, or other substances that may be deleterious to concrete or steel. A maximum of 500 mg/L of chloride ion may be present in the water.

E. Admixtures:

1. Air-entraining admixtures shall meet the requirements of AASHTO Specification M154.
2. Water-reducing and retarding admixtures shall meet the requirements of AASHTO Specification M194 and ODOT Section 701.03. The amount of admixture added to the concrete shall be in accordance with the manufacturer's requirements. Furnish a compliance statement that the admixture used satisfies all requirements of this specification.
3. Fly ash shall meet the chemical and physical requirements of ASTM C 618 for mineral admixture Class F, except loss on ignition shall not exceed 6%. Fly ash shall be sampled and tested in accordance with ASTM C 311 prior to use.

F. Reinforcement:

1. Reinforcing steel shall meet the requirements of ASTM

Specification A 615, Grade 60.

2. Welded wire fabric or wire mesh shall meet the requirements of ASTM A 185.

G. Joint Filler:

1. Preformed expansion joint filler shall meet the requirements of ASTM Specification D 1752, Type III.
2. Hot-poured rubberized asphalt joint filler shall meet the requirements of ASTM Specification D-3405.
3. Waterproof expansion joint filler shall meet the requirements of ASTM Specification D 1850.

H. **Materials for Curing Concrete Pavement:** Concrete pavement shall be wet cured by using burlap, waterproof blankets, or ponding; or by using a membrane compound. If the membrane method is used, the compound shall be Type 2, complying with AASHTO M148 for white pigmented compound. A pressure sprayer capable of applying a continuous uniform film to the pavement surfaces will be required.

1. Concrete pavement shall meet the requirements of ODOT Section 414.
2. Concrete sidewalks and steps shall meet the requirements of ODOT Section 610.
3. Reinforced concrete for curbing shall meet the requirements of ODOT Section 609.

2205.6

CONSTRUCTION METHODS

A. Preparation for Paving and Surfacing

1. Areas to be paved or surfaced shall be clean with temporary pavement materials which are not a part of the permanent pavement, cold-mix asphalt, deleterious or unsuitable materials removed and disposed of.
2. Any existing pavement, surfaces, or walks which are not broken or cut along straight lines shall be cut along straight lines prior to pavement or walk replacement.

B. **Subbase Preparation:** Subbase 6" thick shall be provided in locations where pavement is to be placed on a material other than Special Backfill. Subbase shall meet the requirements of ODOT Section 310.

1. **Pavement Replacement:** All pavements encountered with respect to base courses, surface courses, and thicknesses shall be replaced in kind. Finish elevations, lines, and grades of replacement pavement shall be the same as elevations, lines, and grades of pavement removed, unless otherwise shown on the drawings.
2. *Bituminous Pavements:*
 - (a) Unless otherwise shown on the drawings, the minimum section (excluding subbase) of any bituminous pavement shall be 8" compacted aggregate base (ODOT 703.01, Type A Aggregate Base), 3" hot asphalt concrete (HAC) base, and 2" HAC surface Type B.
 - (b) Alternate Section - Pavements with pavement thicker than 4":

Unless otherwise shown on the drawings, the pavement shall be a full-depth section with a minimum of 4" HAC base plus additional depth to make up full-depth, plus 2" of HAC binder and 2" of HAC surface Type B.

3. *Brick Pavements:* In a brick surfaced street, unless specifically excepted and pending the structural adequacy of any remaining brick, the Contractor may remove all brick and enough base material to allow full width repaving using either a bituminous or concrete pavement; or of providing a HAC base or binder for the full depth of the brick across the trench and then replace the entire street with 2" of HAC surface Type B.
4. *Brick Base and Asphalt Surface:* Unless otherwise shown on the drawings, for a street with a brick base and an asphalt surface, the replacement section shall be full depth asphalt from the bottom of the brick base to the top of the asphalt surface. The top 2" shall be HAC surface Type B.
5. *Concrete Base and Asphalt Surface:* Unless otherwise shown on the drawings, for a street with a concrete base and an asphalt surface, the replacement section shall be a new concrete base, not less than 6" thick with HAC base to within 50 2" of the existing grade and then 2" of HAC surface Type B.
6. *Chip and Seal Pavement:* Unless otherwise shown on the drawings, chip and seal pavements shall have 8" of compacted aggregate base and a processed bituminous coated aggregate pavement placed and rolled as specified in ODOT Section 402.
7. *Gravel Pavement:* Unless otherwise shown on the drawings, gravel pavement shall be replaced with 6" of compacted stone or gravel aggregate as specified in ODOT Section 403.

C. RESERVED

1. *Curbs*The construction of curbs, combination curb and gutter, and integral curb and gutter shall be in accordance with these specifications and as shown on the plans and shall be in reasonably close conformance with the lines and grades shown on the plans or as directed by the Engineer.
2. Excavation for curbs shall be made to the required depth, and the subgrade or base upon which the curb is constructed shall be compacted to a firm, even surface to not less than 95% of maximum dry density as determined in accordance with AASHTO T-99.
3. All curb and gutter shall consist of concrete (ODOT Class A, 6 sack, 3000 psi, water/cement ratio of 0.48, 1" to 3" Slump).
4. The curbs shall be constructed by the use of wood or metal forms; or, if accepted by the Engineer, the curb may be constructed using a curb slipform machine. Forms, if used, shall be straight, free from warped or bent sections, and shall extend for the entire depth of the curb and shall be securely held in place so that no deviation from alignment and grade will occur during placement of concrete. The concrete shall be consolidated by vibration or other acceptable methods. The top of the curb shall be floated smooth and the top outer corner rounded to a 1/4" radius.
5. The face, top, and gutter of curbs shall not have deviations or

irregularities of more than $\frac{1}{4}$ " when checked with a 10-foot straightedge.

6. Construction joints shall be placed at 10-foot intervals, unless otherwise shown or directed by the Engineer. The joint shall be uniform, of $\frac{1}{8}$ " to $\frac{1}{4}$ " in width, and to a depth of approximately $2\frac{1}{2}$ ". The joint may be saw cut or formed by accepted removable strips providing a straight joint at right angles to the length of curb. Joints shall be filled with specified bituminous joint filler material. Construction joints shall be formed around all abutting structures such as inlets and shall be as specified previously.
 7. As soon as possible after placing and finishing of concrete, the curbing shall be moistened and kept moist for three days, or cured with the use of a specified membrane compound.
 8. If existing curb is to be removed and replaced with new curb or new curb extended from existing curb, the existing curb shall be removed to the nearest joint of suitable existing curb or as directed by the Engineer.
- D. **Lane Striping:** Contractor shall stripe new paving with standard road paint. Stripe width and spacing to match that of paving restored or replaced.
- E. **Protection:**
1. Compacted aggregate subbase and surface shall be compacted true to line and grade and required density. Subbase quality, compaction, and moisture shall be maintained until prime coat is placed. Surface shall be maintained until job is complete.
 2. Vehicular traffic of any kind shall not be permitted on any bituminous course until the bituminous mixture has hardened sufficiently not to be distorted beyond specified tolerances. Foreign material which is on the surface of any course shall be removed before the course is rolled or any subsequent course is placed.
 3. Traffic on concrete pavement or walks shall not be permitted until concrete has developed sufficient strength not to be marked or damaged. Vehicular traffic shall not be permitted on concrete until it has reached a compressive strength of 3,000 psi.
 4. Damaged pavement and walks shall be repaired or replaced to the satisfaction of the Engineer.
- F. **Clean-up:** Job site shall be cleaned up following pavement and surfacing restoration. All rubbish, excess materials, temporary structures, and equipment shall be removed the work left in a neat and presentable condition.

2206 RIPRAP

2206.1 DESCRIPTION

This section shall govern the furnishing and installation of riprap upon a prepared surface to a grade and thickness shown or established by the Engineer.

2206.2 DEFINITIONS

- A. **Riprap:** Placed protective material consisting of broken stone or concrete.

- B. **Dumped Riprap:** Riprap emptied out of a vehicle unloaded or dropped in a large mass.
- C. **Revetment Riprap:** Riprap placed to retain a wall of earth with a layer of stone.
- D. **Hand-laid Riprap:** Riprap placed by hand rather than by mechanical means.

2206.3

MATERIALS

- A. **Dumped Riprap:** Dumped riprap shall consist of broken concrete, masonry, or stone removed from an old structure; broken pieces removed from concrete pavement, base, or monolithic brick pavement; and broken rock from a fragmented stone or a solid rock excavation.
- B. **Revetment Riprap**
 - 1. The gradation of the riprap shall be such that:
 - (a) No individual piece weighs more than 120 pounds.
 - (b) 90-100% of the material passes a 12" sieve.
 - (c) 20-60% of the material passes a 6" sieve.
- C. Not more than 10% of the material passes a 1½" sieve.
- D. **Hand-laid Riprap:** Hand-laid riprap aggregate shall consist of pieces, except spalls, no less than 10 ft³ in volume and no less than 3" in the least dimension. The width of these pieces shall be no less than 6" for 6" hand-laid nor less than 12" for 12" hand-laid riprap.
- E. **Filter Fabric:** A special fabric usually used in drainage applications to allow water flow without clogging or binding by soil particles.
 - 1. The fabric consists exclusively of manmade thermoplastic fibers, is a non-woven geotextile fabric, and forms a mat of uniform quality.
 - 2. Fabric fibers are continuous and random throughout the fabric.
 - 3. The fabric is mildew resistant and rot-proof, and it is satisfactory for use in a wet soil and aggregate environment.

2206.4

CONSTRUCTION METHODS

- A. **Dumped Riprap**
 - 1. Dumped riprap shall be placed at locations shown on the plans or as directed.
 - 2. Material shall be placed to produce a surface of approximate regularity but need not necessarily be hand placed.
 - 3. The finished surface shall vary no more than nine inches from true plane. The thickness perpendicular to its surface shall be no more than two feet nor less than one foot, unless otherwise directed.
- B. **Revetment Riprap:** Revetment riprap may be placed by dumping and shall be placed to the required thickness at the locations shown on the plans or at such other designated locations.
- C. **Hand-laid Riprap**
 - 1. Hand-laid riprap shall be placed by hand and shall be no less than the thickness shown on the plans or as specified. For 6" hand-laid riprap, the

thickness shall be no less than 6" and for 12" no less than 12".

2. The slope upon which hand-laid riprap is to be placed shall conform with the cross section shown on the plans. Laying shall begin in a trench below the toe of the slope. It shall progress upward with each piece being laid by hand perpendicular to the slope. It shall be firmly embedded against the slope and the adjoining piece with the sides in contact with well broken joints. The spaces between the larger pieces shall be filled with spalls of suitable size which shall be thoroughly rammed into place.
3. The finished surface shall present an even, tight surface true to line, grade, and section.
4. When broken concrete pavement is used for 6" hand-laid riprap, it shall be laid with the smooth sides up.

D. Filter Fabric

1. Filter Fabric shall be installed in accordance with the manufacturer's recommendations, as indicated on the Drawings or as directed by the Engineer or designated representative. When lapping is required, it shall be in accordance with the manufacturer's recommendations. Backfilling around the Filter Fabric shall be done in such a manner that the Filter Fabric material will not be damaged during the placement.

2207 MEASUREMENT AND PAYMENT

2207.1 SCOPE

This section covers the methods of measurements, and the basis of payment, for the furnishing of all labor, equipment, tools, and materials and for the performance of all related work necessary to complete any construction covered in Section 2200.

2207.2 GENERAL

Unless specifically altered by the Special Conditions, the methods of measurement and payment will be as specified herein, and as listed in the Proposal (Bid Schedule).

2207.3 ITEMS NOT LISTED IN THE PROPOSAL

There will be no measurement or separate payment for any items of work not specifically identified and listed in the Proposal and all costs pertaining thereto will be included in the Contract Unit Prices for other items listed in the proposal.

2207.4 MEASUREMENT AND PAYMENT

The quantities of accepted work will be measured and paid for on a unit price basis determined as follows:

- A. **Concrete Structures:** Measurement and payment for concrete structures shall be on a per each basis, complete in place with all accessories and shall include appurtenant work including excavation and backfill, unless specified otherwise in the Special Conditions and/or Contract Proposal.
- B. **Conduit:** Measurement and payment for conduit, including the carrier pipe, shall be at the contract unit price per linear foot, measured along the centerline of the conduit for the size, type, and installation method included in the Contract Proposal and placed as shown on the plans. All carrier pipe shall be paid for

under other items. Payment for excavation, backfilling, boring, and/or tunneling shall be included in the unit prices included in the Proposal and shall be full compensation for all equipment, materials, tools, labor, and incidentals for a complete installation. No additional payment shall be made for dewatering, skids, or plugging end of conduit.

- C. **Materials Furnished by the City, Installed by the Contractor:** Materials furnished by the City and installed by the Contractor shall be paid for as a lump sum or at the Contract unit price for each unit as described in the Special Conditions or Contract Proposal. Such payment shall be full compensation for all equipment, tools, labor, and incidentals for a complete installation.
- D. **Materials Furnished by the Contractor, Installed by the City:** Materials furnished by the Contractor and installed by the City shall be paid for as a lump sum or at the Contract unit price for each unit as described in the Special Conditions or Contract Proposal. Such payment shall be full compensation for all materials furnished to the site.
- E. **Pavement Replacement:**
 - 1. The replacement of concrete pavement, concrete base, rock for flexible base, and gravel for flexible base shall be paid for at the contract unit price per cubic yard complete in place.
 - 2. Asphaltic concrete pavement shall be paid for at the contract unit price per square yard, complete in place.
 - 3. The replacement of one or two course surface treatment or penetration type pavement surface shall be paid at the contract unit price per square yard complete in place.
 - 4. Curb and curb and gutter shall be paid at the contract unit price per linear foot, complete in place.
 - 5. Sidewalks shall be paid for at the contract unit price per square foot or square yard, complete in place.
 - 6. The contract unit price shall be total compensation for furnishing and placing all materials, including rolling and finishing, for disposal of all surplus material, and for all labor, tools, equipment, and incidentals necessary to complete the work, all in accordance with the plans and specifications.
- F. **Riprap:** Riprap shall be measured and paid for at the unit contract price for square yards of the specified minimum thickness or in cubic yards, based on the dimensions shown on the plans and described in the proposal, or by ton of material in place. The contract unit price shall be the total compensation for preparing the subgrade, including excavation; for furnishing and placing all materials; for furnishing, placing, shaping, and tamping backfill; for disposal of all surplus materials; and for all labor, tools, equipment and incidentals necessary to complete the work, all in accordance with the plans and these specifications.

END OF SECTION 2200

City of Norman
STANDARD SPECIFICATION AND CONSTRUCTION DRAWINGS

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City of Norman
STANDARD SPECIFICATION AND CONSTRUCTION DRAWINGS

SECTION 2300 **STREETS AND DRAINAGE**

2301 ADOPTION OF ODOT STANDARD SPECIFICATIONS

2301.1 SCOPE

The latest edition of the *Oklahoma Standard Specifications for Highway Construction*, as published by the Oklahoma Department of Transportation (ODOT), are hereby adopted as the standard specifications for grading, street, road and drainage construction for the City, except as amended herein. In the event of any conflict between any of the provisions of the *Oklahoma Standard Specifications for Highway Construction* and the specific provisions set forth herein, then in such event the specific provisions set forth herein shall control.

2302 DEFINITIONS

2302.1 TERMS

Certain terms included in the adopted specifications referenced in Section 2301 shall incorporate the following substitution of definitions in their use thereof:

- A. Commission means the duly authorized officers or agents of the City of Norman, Oklahoma constituted by law to administer the affairs of the City.
- B. Department means the City of Norman, Oklahoma, a municipal corporation, acting through its duly authorized officers or agents.
- C. Director means the duly authorized officer of the City in whom executive or administrative powers are vested or his duly authorized representative.
- D. Engineer means the City Engineer of the City of Norman or their duly authorized representative.
- E. Materials Division means the Public Works Department of the City of Norman.

2303 PROCEDURE FOR USING ODOT STANDARD SPECIFICATIONS IN CITY CONTRACTS

2303.1 REVISIONS, AMENDMENTS, AND CLARIFICATIONS

Revisions, amendments, and clarifications to ODOT Standard Specifications shall be included in the Special Conditions of the Contract. The ODOT section shall be referenced by number and description, followed by the required information.

2304 SPECIAL CITY REQUIREMENTS

2304.1 TESTING REQUIREMENTS

- A. **Materials Testing:** Materials testing shall be as specified in the ODOT Standard Specifications.

- B. **Construction Testing:** Testing of completed construction shall be as specified in the ODOT Standard Specifications and Section 1006 of these specifications.
- C. **Tolerances:** Tolerances shall be according to ODOT Standard Specifications except as modified herein.
 - 1. **Pavement Surface Thickness:** Average test thickness shall not be less than the plan thickness, and no individual test thickness shall be deficient by more than 1/4". Maximum thickness to be averaged shall be no more than 1/2" greater than the design thickness. The asphalt pavement core thickness shall be measured according to ASTM D-3549-93a.
 - 2. **Concrete Compressive Strength:** No individual test cylinder for 28-day compressive strength shall be less than the specified strength.

2304.2 SUBGRADE

- A. **Preparation:**
 - 1. When preparing the subgrade, all roots and plant material shall be removed, and the excavation refilled with suitable backfill.
 - 2. When working the subgrade all soft, yielding, or other unsuitable materials, shall either be removed and replaced, or stabilized in place.
 - 3. The subgrade shall be constructed to grade by use of "*blue tops*". "*Blue tops*" shall be placed every 50 ft at both the center line and at the back of curb and gutter. If lime, fly ash, cement etc. is added to the subgrade, the subgrade shall be "*blue topped*" before and after placement of the added material.
 - 4. Dowels are required at all longitudinal and transverse contraction joints in concrete pavement which is 8" thick or greater. Dowel size shall be reviewed and accepted by the City Engineer.
 - 5. The entire subgrade shall be constructed to the required grade, density tests performed and reviewed, and proof rolling completed and reviewed, before construction of the curb and gutter or any other paving.
 - 6. Except where specified elsewhere, the subgrade shall be compacted to 95% standard proctor density at $\pm 2\%$ of optimum moisture.
- B. **Stability Testing:**
 - 1. When preparing subgrades, the subgrade shall be checked for stability, even though it may meet the compaction requirements.
 - 2. The check for stability shall be proof rolling with a large roller or loaded scraper and visual observation to insure that there is no pumping of the subgrade.
- C. **Correction of Unstable Subgrade:**

1. A pumping or otherwise unstable subgrade shall be treated or replaced until it is stable, as determined by the City Engineer.
2. Subgrade drainage shall be considered when a subgrade pumping problem is encountered that is attributed to groundwater. When subgrade drainage is not installed, the engineer shall inform the City Engineer, in writing, of the reasons for not installing subgrade drainage.
3. *Fly Ash:* When used for subgrade stabilization, fly ash shall conform to ODOT 702.01.
4. When Subgrade modification is required, such as lime, kiln dust, or fly ash, it shall be mixed and processed according to the appropriate section of the latest edition of the Oklahoma Standard Specifications for Highway Construction as published by the Oklahoma Department of Transportation (ODOT). When lime is used, 6% will be the minimum percentage provided.

2304.3 **BASE**

- A. **Base Drainage:** Where groundwater or ponding surface water present a threat to base stability a drainage system as shown in Standard Drawing No. ST 22 is required.

2304.4 **CONCRETE PAVING**

- A. Concrete Street General:
 1. Curb and gutter may be placed separate of the pavement, if variance is requested and granted.
 2. Concrete shall be cured with white curing compound.
 3. Joint layouts shall be reviewed by the City Engineer prior to placement of paving. If possible, longitudinal contraction and construction joints shall present logical traffic lanes to the driver.
 4. Dowels are required at all longitudinal and transverse contraction joints in concrete pavement which is 8" thick or greater. Dowels shall be 1¼" in diameter, 18" long spaced at 12" center to center.
- B. Longitudinal Joints:
 1. Longitudinal cracking joints shall be placed at intervals equaling two (2) times the pavement thickness in inches converted to feet (i.e. 2 X 6" = 12" which converts to a 12 foot spacing of longitudinal cracking joints) but, not to exceed every 15 feet.
 2. Longitudinal construction joints on residential and residential collector streets may, at the option of the design engineer, be butt type joints with a tiebar or keyway type without a tiebar.
 3. Longitudinal construction joints on all other streets shall be keyway type with a tiebar.

4. Longitudinal contraction joints shall be made to a minimum depth of one fourth (1/4) the thickness of the pavement.

C. Transverse Joints:

1. Transverse contraction joints shall be placed at intervals equaling two (2) times the pavement thickness in inches converted to feet (i.e. $2 \times 6" = 12"$ which converts to a 12 foot spacing of transverse contraction joints) but, not to exceed every 15 feet.
2. Transverse construction joints on residential collector streets may, at the option of the design engineer, be butt type joints with a tiebar or keyway type without a tiebar.
3. Transverse construction joints on arterial streets shall be keyway type with a tiebar.
4. Transverse contraction joints shall be made to a minimum depth of one fourth (1/4) the thickness of the pavement.

D. Expansion Joints:

1. Expansion joints shall be placed at all street intersection radius and at the last joint before a cul-de-sac.
2. Expansion joints shall have a tiebar when the street being constructed requires a tiebar or keyway for a construction joint.

2304.5 JOINT SEALING

A. Materials:

1. Sealant: Joint sealer shall be of the rubber-asphalt hot-poured type which readily bonds to concrete surfaces type conforming to the following specifications.
2. Pavement: ASTM D6690, Type II
3. Vertical Face of Curb Joints: Federal Specifications TT-S-001543
4. Class A or Polyurethane Sealant: ASTM C-920, Type M, Grade NS, Class 25, Use T.M.
5. Primers: The use of primers when recommended by the manufacturer of the proposed sealant and accepted by the City Engineer, is authorized in accordance with the manufacturer's instructions.
6. Backer Rod: Backer rod shall be made of compressible, closed-cell polyethylene foam, be compatible with the joint sealant, and have the physical properties shown in the following table.

Backer Rod Physical Properties

Density, lbs/cu. ft.	2.0	ASTM D 1622
Tensile Strength, psi	25	ASTM D 1623
Water Absorption by Volume, %	0.5	ASTM C 509
Compression Deflection @ 25%, psi	6	AET Method*
Temperature Resistance, degrees F.	-45 to 410	AET Method

* AET methods are included in pending ASTM specifications for backer material.

B. Equipment:

All necessary equipment shall be furnished by the contractor in accordance with requirements of subsection 108.06 (Methods and Equipment) in the latest version of the ODOT Standard Specifications. The minimum requirements for construction equipment as required to complete the work are specified herein.

108.06 Methods and Equipment (from ODOT Standard Specifications)

It is the intent of the plans and the Contract that, except when specifically provided, methods and equipment used shall be those generally accepted by the industry, and which produce the quality of work expected.

If the contractor desires to use an unusual or experimental method or type of equipment, they shall notify the engineer in writing. The notice shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to use that method or equipment before he begins work. If the Engineer concurs, it is specifically agreed and understood that the Contractor will be fully responsible for producing construction work in conformity with Contract requirements.

If after use, the proposed methods or equipment fails to produce work meeting the requirements of the plans and the Contract, the Contractor shall discontinue the use of that method of equipment and complete the remaining work with conventional methods and equipment in a manner acceptable to the engineer. The contractor shall remove the deficient work and replace it with work meeting the requirements of the plans and Contract. No change will be made in the basis of payment for the construction items involved or in the contract time as a result of a change in methods or requirements under these provisions.

The engineer shall have the final authority to reject any method that cannot produce the required results or equipment, which cannot be properly calibrated or controlled. Rejected equipment shall be removed and replaced with approved equipment.

1. *Concrete Saw:* A self-propelled power saw with water cooled diamond or abrasive saw blades shall be provided for cutting joints to the widths and depths specified, or for refacing joints where surface films of old sealant cannot be readily removed by sandblasting. (See Table 2304.5.1)
2. *High pressure water pumping system:* High pressure water pumping system capable of delivering sufficient pressure and volume of water to thoroughly flush concrete slurry from saw joints.
3. *Sand Blasting Unit:* compressed air pressure type sandblasting equipment of proper size and capacity to clean joint surfaces as specified. The unit shall be equipped for removal of all free water and

oil from the compressed air.

4. *Air compressors:* The air compressor shall deliver air at a minimum of 120 cubic feet per minute, have suitable traps for the removal of all free water and oil from the compressed air and develop at least 0.621 Mpa (90 psi) nozzle pressure.
5. *Sealing Equipment:* The unit applicators used for heating and installing hot-poured sealing materials shall be mobile and shall be equipped with a double boiler agitator-type kettle with an oil medium in the outer space for heat transfer, and a direct-connection pressure-type extruding device with a nozzle or nozzles shaped for insertion in the joints to be filled, positive devices for controlling the temperature of the oil and the sealant, and a recording type thermometer for indicating the temperature of the sealer. The applicator shall be so designed that the sealant will circulate through the delivery hose and return to the inner kettle when not sealing a joint.
6. *Injection Tool:* A mechanical injection device as required for applying the sealer into the joint.

C. Construction Methods:

1. *Sawing joints:* The existing contraction joints shall be cut to the width and depth shown on the saw table below. Sawing shall be done in such a manner as to produce a new joint having a cut face on both sides and be uniform in width along its full length. Only sawing will be allowed for joints, no routing is allowed.

Table 2304.5.1
Existing Contraction Joints
Widths and Depths

<i>Joint Width, (Inches)</i>	<i>Joint Depth, Min (Inches)</i>	<i>Sealant Bead Thickness (Inches)</i>	<i>Backer Rod Placement Depth (Inches)</i>
3/8	1 5/8)	3/8	5/8
1/2	1 3/4)	1/2	3/4
5/8	2	5/8	7/8
3/4	2 1/4	3/4	1
7/8	2 1/2	7/8	1 1/8
1	2 3/4	1	1 1/4

2. *Random Cracks:* Cracks are to be sawed by a pushed power saw with abrasive or water-cooled diamond saw blades to the width and depths specified (See Table 2304.5.2 Below). No backer rod will be required for random cracks.

NOTE: Routing and or plowing will be allowed prior to sawing and sand blasting. The Contractor must clean the joint face by sawing and sand blasting **after** the joint has been plowed or routed. V-shaped plows are not allowed, only rectangular.

Table 2304.5.2
Random Cracks
Table of Widths and Depths

<i>Joint Width</i>	<i>Joint Depth, Min</i>	<i>Sealant Bead Thickness</i> (bottom of joint to within 1/4" of the surface)	<i>Backer Rod Placement Depth</i>
<i>(Inches)</i>	<i>(Inches)</i>	<i>(Inches)</i>	<i>(Inches)</i>
3/8	3/4 Min.	1/2	N/A
1/2	"	"	N/A
5/8	"	"	N/A
3/4	1	"	N/A
7/8	1	"	N/A
1	1	"	N/A

3. Preparation of Cracks: The specifications, which apply to joints, shall also apply to cracks. Hairline cracks shall not be routed and sealed. The construction inspector shall define a hairline crack on the job site.

The minimum joint width of all joints or cracks to be sealed shall be 3/8".

4. Flushing Joints: Within 5 minutes after sawing, the resulting slurry shall be removed from the joint and immediate area by flushing with a high-pressure water system and other equipment necessary to thoroughly remove the slurry.
5. Cleaning Joint Faces:
- (a) **General:** The cut faces of the joints shall be thoroughly cleaned of all foreign materials, as may be required for proper installation and bonding of the joint sealer or filler, including old sealant or any residue from water flushing operations, by sandblasting as required. The use of portable hand-saws will not be permitted for cleaning joint faces.
 - (b) The cut faces of the joint shall be thoroughly air dried for a minimum of 48 hours after flushing the water. Blow drying of the joints with compressed air will not be permitted.
 - (c) **Sandblasting:** After complete drying, the joint shall be sandblasted. The sandblasted nozzle shall be attached to a mechanical aiming device so as to direct the sandblast at approximately a 45 degree angle and at a maximum of 2 inches from the faces of the joint. Both joint faces shall receive sandblasting. After sandblasting the joints shall be blown out using filtered oil free and moisture free air at a minimum of 90 psi and 120 cfm. Blowing out of the joint shall be accomplished by using a blow tube which will fit into the joint.

- (d) **Joint Contamination:** In the event the open joints prepared for installation of joint sealing materials become contaminated by traffic, or the result of weather conditions, they shall be re-cleaned as specified above as approved by the Engineer.
 - (e) **Subdivision Development:** The contractor for the developer shall assure that all concrete joints are clean, dry and the proper width before the sealant is installed and that the bond breaker rod as specified below has been installed per these specifications. The City's construction inspector shall approve all joints before the sealant is installed. The sealant, as specified in these specifications, shall be used. The sealant shall be installed per these specifications.
6. **Bond Breaker Rod:** When shown on the plans or recommended by the sealant manufacturer, a bond breaker rod shall be installed prior to application of the joint sealant. The bond breaker rod shall be of the type recommended by the manufacturer of the sealant material. The bond breaker rod shall be installed in a manner that will produce the dimensions (width and depth) described on the Plans.
7. **Sealing Joints:**
- (a) ***Approval of Joints for Sealing:*** The Department's inspectors will examine joints prepared for sealing just prior to installation of the joint filler or sealer. Joints will not be approved for sealing if contaminated or not adequately dry as required for bonding of sealing materials.
 - (b) ***Installation of Joint Sealers and Fillers:***
 - (c) ***General:*** A representative of the joint filler and/or joint sealer manufacturer shall be on the job site at the beginning of the joint sealing operation to demonstrate to the Contractor and to the Department's inspectors the manufacturer's acceptable standards for installation of the joint sealant materials.
 - (d) ***Application of Joint Sealers:***
 - (1) ***Joint Sealers:*** The joint sealer shall be applied, using a mechanical injection tool approved by the Engineer. Application of the joint sealer will not be permitted when the joint temperature is less than 40°F (4°C). Joints shall not be sealed unless they are thoroughly clean and dry. Sealers to fill the joint shall be injected into the joint and applied in a manner which causes it to bond to the joint face surfaces. The surfaces of sealers requiring tooling shall be tooled, using an approved mechanical device to produce a slightly concave surface approximately 0.25 inches below the pavement surface. Tooling shall be accomplished before a skin forms on the surface of the sealer. The use of soap or oil as a tooling aid will not be

permitted. Tooling will not be required if the sealer is self-leveling.

- (c) **Bonding Failures:** Failure of the sealant to bond to sawed surfaces of the concrete joint will be cause for rejection and shall be at the Contractor's expense to replace the sealant.
8. Traffic: Traffic shall not be allowed on the fresh applied sealant until it becomes tack free.
- D. Rate of Progress of Joint and Crack Preparation:
- E. The work required for the removal of existing joint sealant including widening and/or deepening of joint openings if required, and refacing of joint walls shall proceed at an appropriate rate of progress determined acceptable to the Engineer. The final stages of joint preparation, including sandblasting of the joint faces, air pressure cleaning of joints, and placement of backer rod shall be limited to only that lineal footage of joint that can be resealed during the same workday.
- F. Installation of Backer Rod:
1. After the existing sealant has been removed to the required depth, the backer rod shall be installed at the depth recommended by the sealant manufacturer. The backer may be installed by hand using a blunt tool or a roller device. The size of the backer rod for each joint shall be in accordance with the following table (2304.5.3).
- Table 2304.5.3
Backer Rod Size**
- | <i>Joint Width
(inches)</i> | <i>Rod Diameter
(inches)</i> |
|---------------------------------|----------------------------------|
| 3/8 | 1/2 |
| 1/2 | 5/8 |
| 5/8 | 3/4 |
| 3/4 | 7/8 |
| 7/8 | 1 |
| 1 | 1-1/4 |
- G. Sealant Preparation:
1. Hot-poured sealing material shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on sealant containers. Sealant that has been overheated or subjected to heating for over three hours or that has remained in the applicator at the end of the day's operation shall be removed and disposed of. Material may be added to the melter as the sealant is withdrawn during the sealing operation.
- H. Sealant Installation: (See Standard No. ST-29)
1. Time of Application (New Pavement and Concrete Patches):

- (a) Joints shall be sealed immediately following the concrete-curing period or as soon thereafter as weather conditions permit. The concrete walls of the joint shall be surface dry, and atmospheric and pavement temperatures shall be above 40°F (4°C) at the time of application of the sealant. Open joints that cannot be sealed under the conditions specified herein shall be sealed with an approved temporary seal to prevent infiltration of foreign particles. When rain interrupts sealing operations, joint shall be recleaned prior to installing sealant.

2. Time of Application: (Existing Joints to be Resealed):

- (a) Joints shall be sealed immediately following the sandblast cleaning of the joint walls and following placement of the backer rod. The concrete walls of the joint shall be surface dry, and the atmospheric and pavement temperatures shall be above 40°F (4°C) at the time of application of the sealant. Open joints ready for resealing that cannot be sealed under the conditions specified herein, or when rains interrupt sealing operations, shall be recleaned prior to installing of the sealant.
- (b) Sealing Joints: No joint sealant shall be installed until the cleaned joints have been inspected and approved by the City of Norman's construction inspector. Excess of spilled sealant shall be removed from the pavement by approved methods and discarded. In no cases shall the sealant extend above the surface and if inadvertently so placed, shall be removed. When a primer is supplied by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's recommendations. The joint shall be checked frequently to insure that the newly installed sealant is cured to a tack-free condition within 3 hours.
- (c) Final Acceptance: In place sealant which is not completely bonded to the concrete surfaces of the joint walls, or develops cohesive failures within the sealant, or contains voids or entrapped air, or fails to set to a tack-free condition within 24 hours will be rejected. Sealant may be rejected at any time prior to final acceptance of the project. Sealant which is rejected shall be removed from the joint, wasted and replaced in a manner satisfactory to the City Engineer at no additional cost to the City
- (d) Installation of sealant in vertical face of curb and top of curb: Contractor shall use a polyurethane sealant in this area which meets the following specifications: ASTM C-920, Type M, Grade NS, Class 25, use T.M. or Federal Specification TT-S-001543. This work will be paid at the same unit price per lineal foot as the rubberized asphalt.

I. Measurement:

1. Field Measurements, in lineal feet shall be made as necessary to determine the actual quantity placed. The City of Norman's construction inspector shall make the measurements. The contractor may have personnel present when measurements are made if he so desires.

J. Payment:

1. The quantity of cleaning and sealing to be paid will be determined by the actual measurement of the number of lineal feet of sealed joints and cracks in place rounded off to the nearest lineal foot. Payment will be made at the contract unit bid prices per lineal foot for the cleaning and sealing item. The unit bid price shall include the cost of all labor and materials and the use of all equipment and tools.

2304.6 CURB AND GUTTER

A. General:

1. Curb and gutter may be placed separate of the pavement, if variance is requested and granted.
2. Concrete shall be cured with white curing compound.

B. Transverse Joints:

1. Transverse cracking joints shall be placed at intervals equaling the spacing used for the street.
2. Transverse construction joints on curb and gutter shall match the type of joint required for the type of street being constructed.

C. Expansion Joints:

1. Expansion joints shall be placed at all street intersection radius and at the last joint before a cul-de-sac.
2. Expansion joints shall have a tiebar when the street being constructed requires a tiebar or keyway for a construction joint.

- D. Joint Sealing: The joints in the gutter up to 1" above the flow line will be sealed with rubberized asphalt sealer conforming to ASTM D-3405. Vertical face of curb joints shall be cleaned and sealed with silicone conforming to ODOT 701.08(e) or polyurethane sealant conforming to ASTM C-920, Type M, Grade NS, Class 25, use T.M.

2304.7 SIDEWALKS

A. Sidewalk Base Preparation:

1. When constructing sidewalks, the concrete shall be laid on a firm, smooth surface at an average depth below finish grade equal to the thickness of the sidewalk.

2. All soft and yielding or other unsuitable materials shall be removed and replaced with suitable material before construction of the sidewalk.
3. The sidewalk shall be constructed on leveling bed of 2" of compacted crushed aggregate base or recycled aggregate base.
4. All sidewalks shall consist of concrete (ODOT Class A, 6 sack, 3000 psi, water/cement ratio of 0.48, 1" to 3" Slump).
5. There shall be an initial inspection of forms and a final inspection upon completion.

B. Finish and Joints:

1. Sidewalks shall have a non-slip broomed surface.
2. Expansion joints shall be placed at all intersections with curbs.
3. Transverse cracking joints will normally be tooled or sawed into the finished sidewalk to a depth of 1".
4. Transverse cracking joints shall be placed at intervals not to exceed every 5'.
5. The cross slope shall be 2% or less at all locations and be constructed in compliance with the most current version of the 2010 ADA Standards for Accessible Design, as noted in the City of Norman Engineering Design Criteria.
6. Edge all outside edges of walk and all joints with 0.25" radius edging tool.
7. Form construction joints around all abutting structures and appurtenances such as manhole, utility poles, hatches, and fire hydrants. Install 0.5" thick premolded expansion joint filler in construction joints. Expansion joint material shall extend for the full depth of the walk.
8. When connecting a new sidewalk to an existing 4" sidewalk, excavate an additional 2" below the existing sidewalk and place a 6" thickened edge.
9. At the beginning and the end of the days pour and at a construction joint, a 6" thickened edge is required with either (2) #3 x 12" rebar or a 2" x 2" keyway.
10. Sidewalk and driveways are to be backfilled and compacted immediately after forms are removed.
 11. Curing Concrete: Exposed surfaces of concrete shall be protected by accepted methods from premature drying for a period of at least seven (7) days. Curing compounds, when accepted by the Engineer, shall be applied according to the manufacturer's recommendations, and shall not be used on any surface against which additional concrete is to be bonded, nor on surfaces which will be painted. In dry, hot weather, forms shall be removed as early as practicable, and curing started immediately. The Engineer may require the frequent wetting of the concrete and the use of means to protect it from the direct rays of the sun.

12. Expansion joints shall be placed at curbs, driveways, or abutting structures. All expansion joints shall be constructed with a 6" thickened edge and 3/8" diameter smooth dowels at 24" spacing as shown on drawing Standard No. ST-14. Expansion joints shall be required at intervals of 50 feet.
13. Upon completion of the work and before the final inspection, the site shall be clean of any work surplus, discarded material, temporary structures, and debris of any kind.

2304.8 STRIPING:

- A. Striping shall be Thermoplastic or Paint (Multipolymer) based on the roadway's material type and volume, in vehicles per day. See the Engineering Design Criteria for selection and use of striping.
 1. **Thermoplastic:** Hot applied thermoplastic traffic stripe shall meet the requirements of ODOT 711.01 and shall be applied in accordance with ODOT 855.04.
 2. **Paint (Multipolymer):** Traffic stripe paint shall conform to and be applied in accordance with ODOT 856.

2304.9 STORM SEWER

- A. Storm Sewer Pipe Permitted:

	<i>Description</i>	<i>AASHTO Specification</i>	<i>ASTM Specification</i>
1.	Reinforced Concrete Round Culvert, Storm Drain and Sewer Pipe	M170	C76
2.	Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe	M207	C507
3.	Joints for Concrete Pipe, Manholes and Precast Box	M198	C443
4.	Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe	M206	C506
5.	Pre-Cast Concrete Manholes	M199	C478
6.	Pre-Cast Reinforced Concrete Box Culvert	M259/273	C789/850
7.	Polyvinyl Chloride (PVC) Pipe		D3034
8.	Corrugated Polypropylene Pipe	M330	F2881

- B. Concrete Storm Sewer Pipe Joint Seals:
 - 1. For zero internal head storm applications use AASHTO M170, M206, or M207 concrete products with Omni-Flex seals or butyl rope (Ram-neck), installed according to the manufacturer's recommended external joint openings. Use manufacturer's gap sheet.
 - 2. For concrete storm sewers with low internal head (30'), use AASHTO M242 concrete products with ASTM C443 confined O-ring or Forsheda gaskets.
- C. Removal of Water: All dewatering shall be incidental to other items of work and shall be provided at no cost to the City.
- D. Testing:
 - 1. Paved areas: One density test (AASHTO T-238) per street crossing
 - 2. Non-paved areas: One density test per 300 lineal feet of trench in the haunching for all pipe except concrete.

2304.10 ASPHALT PAVING

- A. Tack Coat:
 - 1. A tack coat shall be required between lifts of asphalt.
 - 2. The face of the gutter on the concrete curb and gutter shall have a tack coat before asphalt is placed on the subgrade.
- B. Asphalt Testing:
 - 1. Target density of asphalt pavement will be 94% of maximum theoretical as determined by AASHTO T 209, with the acceptable range being 92% to 97%. Densities of 91.99% to 88.10% shall be subject to a penalty as described on table 3 below and in Section 411.04 of the latest edition of the Oklahoma Department of Transportation "Standard Specifications for Highway Construction". The penalties shall be paid to the City of Norman for future pavement maintenance costs and shall be paid before final acceptance of the development by City Council. The penalty shall be based on the documented original contract price of the asphalt pavement between the contractor and developer. The City Engineer shall calculate the penalty to be paid. Densities above 97% and below 88.1% shall be considered unacceptable and shall be, as determined by the City Engineer, either removed and replaced by the contractor at no cost to the developer or left in place with a 100% penalty being paid to the City of Norman.
 - 2. If the No. 200 sieve mixture or percent AC soluble in solvent of the constructed asphalt pavement does not meet the approved job mix formula, then a penalty shall be paid to the City of Norman. The penalties shall be calculated using the following tables. If the above test results fall in the unacceptable range, the asphalt pavement will be, as determined by

the City Engineer, either removed and replaced or left in-place with a 100% penalty being paid to the City of Norman. The penalty shall be as stated in Paragraph 1 above.

Table 1
Percent AC Soluble in Solvent

+-% Deviation beyond tolerance based on job mix formula	% of contract price to be paid contractor
0.01 - 0.14	94.00
0.15 - 0.24	93.00
0.25 - 0.34	92.00
0.35 - 0.44	91.00
0.45 - 0.54	90.00
Greater than 0.54	Unacceptable

Table 2
NO. 200 Sieve Mixture

+-% Deviation beyond tolerance based on job mix formula	% of contract price to be paid contractor
0.01 - 0.14	98.00
0.15 - 0.24	95.00
0.25 - 0.34	91.00
0.35 - 0.44	87.00
0.45 - 0.54	83.00
0.55 - 0.64	78.00
0.65 - 0.74	72.00
0.75 - 0.84	66.00
0.85 - 0.94	60.00
0.95 - 1.04	53.00
Greater than 1.04	Unacceptable

3. A minimum of three (3) roadway cores are to be taken per days run, up to 875 tons. For tonnage less than 725 tons, the contractor must submit a written request to cut less than three (3) cores before cutting cores.
4. All core densities below 92% and above 96% shall be re-cored within three (3) feet of the failing core. Only one re-core of the original core locations shall be allowed. The City's construction inspector shall observe the re-cores. If the re-cores densities fail, the contractor will be penalized per section 2304.10 B 1. Re-rolling asphalt will not be allowed once the asphalt temperature falls below 180° F (82.2° C).
5. The thickness of asphalt cores shall be measured according to ASTM D 3549-93a.
6. The penalty for the asphalt density test, AC content test and No. 200 sieve mixture test, shall be assessed only on the test failure that produces the greatest penalty.

NOTE: A minimum of 3 core densities will be required per type of mix per project.

EXAMPLE:

		<i>Required Tests</i>
Project Length	800'	3 Full Depth Cores
Width of Asphalt	24'	* 3 "S3" mix cores density
Type "S3" Asphalt	470 Ton	* 3 "S4 & S5" mix cores density
Type "S4 & S5" Asphalt	235 Ton	1 "S3" extraction & gradation
		1 "S4 & S5" extraction & gradation
		2 Rice Tests "S3" & "S4 & S5"

* NOTE: Each lift of asphalt is to be cored before placement of the next lift.

Acceptance and pay adjustments will be based on a test by the City of Norman and in accordance with the following schedule:

Table 3
Target density of asphalt pavement

Average Lot Density % of Maximum Theoretical Density (ALD)	Pay Adjustment Factor (PAF)
Above 97	Unacceptable *
92 – 97	1.00
91 – 92	$1.00 - (0.07)(92 - \text{ALD})$
88.1 – 91	$0.93 - (0.15)(91 - \text{ALD})$
Below 88.1	Unacceptable *
Adjustment Payment = PAF x Contract Unit Price	

* Unless otherwise directed by the Engineer, products testing in this range are unacceptable and shall be removed and replaced at no additional cost to the City of Norman.

C. Header Curb:

- Asphalt streets with temporary end-of-pavement sections shall be completed with either a 6" wide by 12" deep concrete header curb, or the asphalt pavement shall be extended 10-feet beyond the design pavement section. When extending the asphalt pavement, the asphalt shall be saw cut and a butt joint used.

END OF SECTION 2300

City of Norman
STANDARD SPECIFICATION AND CONSTRUCTION DRAWINGS

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City of Norman
STANDARD SPECIFICATION AND CONSTRUCTION DRAWINGS

SECTION 2400 WATER LINES

2401 GENERAL REQUIREMENTS

2401.1 SCOPE

This specification is to govern the furnishing of all materials, labor, equipment, tools, superintendence, and other services necessary to construct water mains, complete with appurtenances including extensions and relocations at the locations shown on the plans or specified. This section governs materials for water mains having a diameter of 4" through 64" and water service lines less than 4" .

2401.2 ABBREVIATIONS

Wherever the words, forms, or phrases herein defined, or pronouns used in their stead occur in these specifications, in the contract or in the Advertisement of any document or instrument herein contemplated or to which these specifications apply, the intent and mean shall be interpreted as defined in Sections 1008 and 1009.

2401.3 CODES, SPECIFICATIONS, AND STANDARDS

Codes, specifications, and standards referred to by title or number shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply in all cases. Specific reference standards include:

- A. Title 252. Oklahoma Administrative Code, Chapter 626, Public Water Supply Construction Standards, ODEQ
- B. Water System Operations, AWWA
- C. Standards and Manuals of Practice, AWWA
- D. Backflow and Cross-Connection Manual, AWWA
- E. Code of Ordinances, City of Norman

2401.4 QUALITY ASSURANCE

- A. The Contractor shall test and disinfect water mains as specified in Section 2403.9.

2401.5 SUBMITTALS

- A. Submittals shall be as specified in the General Conditions.
- B. Submit the following:
 - 1. Manufacturer's Certificate of Compliance certifying compliance with the applicable specifications and standards.
 - 2. Certified copies of test reports of factory tests required by the applicable standards.
 - 3. Shop drawings with performance data, physical characteristics, and dimensional layouts for piping, fittings, valves, hydrants, and precast concrete units.

2402 PRODUCTS

2402.1 PIPE AND FITTINGS

- A. Polyvinyl Chloride Pipe (PVC)
 - 1. Pipe

- Polyvinyl chloride pipe shall meet the requirements of AWWA C900 DR-18 (235 psi) for all pipe sizes.
- Polyvinyl chloride pipe shall have ductile-iron-pipe-equivalent outside diameter.
- Pipe joints shall be push-on type, meeting the requirements of AWWA C900.
- Mark each length of pipe in accordance with AWWA C900.

2. Fittings and Glands

- Fittings and glands shall be ductile iron. Fittings shall meet the requirements of ANSI A21.10/AWWA C110 or ANSI A21.53/AWWA C153. Design and manufacture fittings for a pressure rating compatible with that of the pipe.
- Fitting joints shall be mechanical joints. Mechanical joints shall meet the requirements of ANSI A21.11/AWWA C111.
- Mark each fitting. Marking shall meet the requirements of ANSI A21.10/AWWA C110.
- All ductile iron pipe fittings and glands shall be factory applied fusion bonded epoxy coated which meets AWWA C116.

3. Adapters

- Adapters from polyvinyl chloride water mains to flanged valves or fittings shall be ductile iron. Adapters shall meet the requirements of ANSI A21.10/AWWA C110. Design and manufacturer adapters for a pressure rating compatible with that of the pipe.
- EBAA Megalug restraints, or approved equal, shall be used for all sizes which are available and shall be fusion bonded epoxy coated per AWWA C116.
- Adapter ends connecting to polyvinyl chloride water mains shall have plain ends or mechanical joints. Mechanical joints shall meet the requirements of AWWA C111 and C153.
- Adapter ends connecting to flanged valves or fittings shall have joints complying with the specifications for the applicable valves or fittings.

4. Gaskets:

- Gaskets for polyvinyl chloride push-on joints shall meet the requirements of AWWA C900.
- Gaskets for mechanical joints shall meet the requirements of AWWA C111 and AWWA C153.

5. **Nuts and Bolts:** Nuts and bolts for mechanical joints shall be 304 Stainless Steel. Nuts shall be hexagon nuts and Teflon coated. Bolts shall be tee head bolts. Nuts and bolts shall meet the requirements of ANSI A21.11/AWWA C111.

B. High density polyethylene pipe (HDPE)

1. Pipe:

- High density polyethylene pipe (HDPE) shall be only used for trenchless directional drilling applications where no service connections are proposed. Additionally, HDPE wall thickness shall be considered when selecting the appropriate pipe size for hydraulic conditions.
- High density polyethylene pipe (HDPE) shall meet the requirements of AWWA C906, SDR-11.
- High density polyethylene pipe (HDPE) shall have ductile iron pipe equivalent outside diameter.
- Pipe joints shall be by thermal butt-fusion, flange assemblies, or mechanical methods as may be recommended by the pipe supplier. Polyethylene piping shall not be joined by solvent methods, adhesives, or threaded-type connections.
- Mark each pipe in accordance with AWWA C906.

2. Fittings:

- Fittings and glands shall be ductile iron and selected in accordance with AWWA C906 and utilize Ductile Iron Pipe Sizing (DIPS).
- Transition between HDPE and other pipe materials shall utilize mechanical fittings specifically designed for use with HDPE Pipe. Stainless steel internal stiffeners shall be installed in the end of the HDPE pipe when HDPE pipe is connected to a non-HDPE pipe, valve, fitting, or into the hub of a bolted coupling. Stiffener will be rated for DR and ID of pipe and 304 or 316 stainless steel. For welded-on HDPE adapters, the stiffener may be integral to the adapter.

C. Ductile-Iron Pipe:

1. Pipe

- Ductile iron pipe shall meet the requirements of ANSI A21.51/AWWA C151 and only used upon approval by the Utilities Engineer. Design and manufacture pipe for a working pressure of 150 psi plus 100 psi surge and a safety factor of 2. Minimum pressure class shall be as follows:

<u>Size Range</u>	<u>Pressure Class</u>
12" and smaller	350
14" through 24"	250
30" and larger	150

- Pipe joints shall be push-on type. Joints shall meet the requirements of ANSI A21.11/AWWA C111.
- Each length of pipe shall be marked with pipe class, casting period, manufacturer's name or trademark, and year of manufacturer. Marking shall meet the requirements of ANSI A21.51/AWWA C151.

2. Fittings and Glands

- Fittings and glands shall be ductile iron. Fittings for standard size fittings shall meet the requirements of ANSI A21.11/AWWA C110. Compact or short body fittings 3" through 16" shall meet the requirements of ANSI A21.53/AWWA C153. Design and manufacture fittings for a pressure rating compatible with pipe used.
- Fitting joints shall be mechanical joints or restrained push-on joints. Joints shall meet the requirements of ANSI A21.11/AWWA C111. Provide restrained mechanical joints as indicated on the drawings and specified in this Section. Restrained joints may be used instead of mechanical joints and thrust blocking. Restrained joints shall be Lok-Ring, Lok-Fast, Lok-Tyte, Megalug, or equal. Pipe connecting to restrained joint fittings shall also have restrained joints as indicated on the drawings and specified in this Section.
- Mark each fitting. Marking shall meet the requirements of ANSI A21.10/AWWA C110.
- Accepted manufacturers of ductile iron pipe include: U.S. Pipe and Foundry, American Cast Iron Pipe Co., and Griffin Pipe Company.
- All ductile iron pipe fittings and glands shall be factory applied fusion bonded epoxy coated (interior and exterior) which meets AWWA C116. The epoxy coating shall be installed per the coating manufacturers specifications. A Certificate of Compliance shall be required from the coating manufacturer stating that the coating meets all requirements mentioned herein. Holiday testing shall be required per ASTM G 62. The epoxy coating and the factory that applies the coating shall be approved by the Utilities Engineer. Fittings shall not be cement lined.

D. Pipe and Fittings Smaller than 3-Inch

1. **Pipe:** Pipe shall be HDPE SDR9 – blue, CTS. Copper tubing, Type K, Class 1, conforming to ASTM B88 may be used for areas contaminated with or located near possible hydrocarbon contaminants. Tubing shall be

suitable for use with compression-type fittings.

2. Fittings and Couplings:

- Fittings shall be brass conforming to ASTM B62 (Table 1) or ASTM B584. Brass shall have a tensile strength of not less than 30,000 psi when tested according to ASTM B208. Fittings shall be designed for 200 psi working pressure.
- All castings shall be smooth, free from burrs, scales, sand holes and defects of every nature which would make them unfit for the use for which they are intended.
- Nuts shall be smooth cast and shall have symmetrical hexagonal wrench flats.
- All thread fittings, of all types, shall have N.P.T. threads, and male threaded ends shall be protected in shipment by a plastic coating or other equally satisfactory means.
- Compression tube fittings shall have a Buna-N beveled gasket or equal.

E. Water Services:

1. **Controlling Brass Specifications** - All brass fittings and valved shall be manufactured in accordance with the AWWA Standard C800, latest version as further specified; any brass part of the fitting or valve in contact with potable water shall be made of a "No-Lead Brass", defined for the specification as UNS Copper Alloy C89520 in accordance with the chemical and mechanical requirements of ASTM B 584, or copper alloy CDA No. C 89833, and shall be certified by an ASNI accredited test lab per ASNI/NSF Standard 61/600. Permitted manufacturers: Mueller Company, Ford Meter Box Company and A.Y. McDonald Company.
2. **Service Saddle** – All Stainless Steel, 304 (18-8) per ASTM A420, with CC thread – $\frac{3}{4}$ " through 2", single strap for $\frac{3}{4}$ " – 1", double strap for 1 $\frac{1}{2}$ " – 2".
3. **Corporation Stops** – CC thread with pack joint (PJ) compression fitting for copper tube size pipe (CTS). Taps shall be at an angle of 45 degrees off the horizontal – never vertical. Multiple taps (two or more) shall be staggered around pipe circumference, and a minimum of 12" apart.
4. **Inserts for High Density Polyethylene Pipe (HDPE) Tubing** – Number 51 stainless steel for copper tube size pipe (CTS).
5. **High Density Polyethylene (HDPE) Pipe** – SDR 9 copper tube size (CTS); blue in color.
6. **Meter Valve / Straight Valve** – Brass valve shall be full port and pack joint compression connections for the following approved valves: 1" by $\frac{2}{4}$ " meter nut, 1" by 1" meter nut, 1.5" by meter flange, and 2" by meter flange.
7. **Coupling Connections** – PJ CTS compression by PJ CTS compression.
8. **Meter Boxes** – The listed meter boxes shall be made of High Density Polyethylene (HDPE), Carson-Brooks model 2200-18 with cast iron lid or approved equal by the Utilities Engineer for water meters in size from $\frac{3}{4}$ " to 1". For 1.5" water meter installation Cason-Brooks 1324 with cast iron meter reader lid or approved equal by the utilities Engineer, and for 2"

water meter installations Carson-Brooks 1730 1730 with cast iron meter reader lid of approved equal by the Utilities Engineer.

9. **Tracer Wire** – #12 AWG solid copper wire with 30 mil HDPE coatings, installed with watertight connections on all service lines, short of long, from corporation stop to meter valve.
10. **Meter Setters** – Meter Setters shall be Ford Meter Box Company, Inc Series 70 copper setters with inlet ball valve and outlet cartridge dual check valve (VBHC) with minimum 9” high setter height, or approved equal.

F. Stops and Cocks:

1. Stops and cocks shall be brass conforming to ASTM B62 (Table 1) and shall be full size throughout the size specified.
2. Seating surfaces of the ground key type shall be tapered and shall be accurately fitted together by turning the key and reaming the body. Seating surfaces shall be lapped together using suitable abrasives to insure accurate fit. The large end to the tapered surface of the key shall be reduced in diameter for a distance that shall bring the largest end of the seating surface of the key into the largest diameter of the seating surface of the body, and the taper seat in the body shall be relieved on the small end, so that the small end of the key may extend through, to prevent wearing of a shoulder and to facilitate proper seating of the key. The stem end of the key, key nut and washer shall be so designed that if the key nut is tightened to the failure point, the stem of the key shall not fracture. The nut and the stem shall withstand a torque on the nut of at least three times the necessary effort to properly seat the key without failure in any manner.
3. The ball stop shall have a full-size round-way opening with straight-through flow, Teflon coated bronze ball with a minimum of .5 mil thickness coating. The stop must be so constructed that it may be disassembled and the ball removed without special tools.
4. Plug type stop shall have full size round way opening with straight-through flow. Seating surfaces shall be brass (or Teflon coated brass) to rubber O-rings, providing positive pressure seal without mechanical means. The stop must be so constructed that the plug may be removed without special tools. Material for rubber O-rings should conform to requirements of ASTM D 450 (test method shall be Rubber O-Rings, ASTM D 1414).
5. Inlet and outlet threads, of the types specified, shall conform to the applicable tables of AWWA C300, and inlet threads shall be protected in shipment by a plastic coating or other equally satisfactory means. If used, coupling nuts shall have a bearing skirt machined to fit the outside diameter of the pipe for a length at least equal to the outside of the pipe.
6. Corporation stops shall be designed as to rotate about the axis of the flow passageway within a circle of rotation small enough to properly clear the inside of any standard tapping machine of appropriate size.

G. Adapters:

1. Adapters from ductile iron water mains to flange joint valves or fittings shall be ductile iron. Adapters shall meet the requirements of ANSI

A21.10/AWWA C110, or ANSI A21.53/AWWA C153. Design and manufacture adapters for a pressure rating compatible with pipe used.

2. Adapter ends connecting to ductile iron water mains shall have plain ends, push-on joints, mechanical joints, or restrained push-on joints. Adapters with plain ends, push-on joints, or mechanical joints may be used where restrained joints are not required. Adapters shall have restrained push-on joints where restrained joint piping is required as indicated on the drawings and specified in this Section. Mechanical joints and push-on joints shall meet the requirements of ANSI A21.11/AWWA C111. Restrained joints shall be Lok-Ring, Lok-Fast, Lok-Tyte, Megalug, or equal.
3. Adapter ends connecting to flange joint valves or fittings shall have joints complying with the specifications for the applicable valves or fittings.
4. **Lining and Coating:** Line the inside surfaces of all pipe with double cement mortar lining and bituminous seal coat. Cement mortar lining and bituminous seal coat shall meet the requirements of ANSI A21.4/AWWA C104. Coat the exterior of the pipe and fittings with a 1 mil bituminous coating in accordance with AWWA C110 and AWWA C151, unless specified otherwise. All ductile iron pipe and fittings shall be coated with a layer of arcsprayed zinc per ISO 8179 before applying the bituminous coating asphaltic top coating in accordance with the pipe manufacturer's recommendations.
5. **Gaskets:** Gaskets for mechanical joints and push-on joints shall meet the requirements of ANSI A21.11/AWWA C111.
6. Nuts and Bolts:
 - Nuts and bolts for mechanical joints shall be 304 Stainless Steel. Nuts shall be hexagon nuts and Teflon coated. Bolts shall be tee head bolts. Nuts and bolts shall meet the requirements of ANSI A21.11/AWWA C111.
 - Nuts and bolts for restrained push-on joints shall meet the requirements of the joint manufacturer.
7. **Tapping Sleeves:** Tapping sleeves shall be standard mechanical joint type for iron pipe and shall comply with all applicable requirements of ANSI A21.10/AWWA C110 for iron fittings. Tapping sleeves shall be furnished with a flanged outlet conforming in dimensions and drilling to ANSI B16.1, Class 125. Tapping sleeves shall be stainless steel full circle with 304 stainless steel flange, bolts and nuts with a mechanical joint outlet. Tapping sleeves shall be used for connections to pipe sizes 24" and larger.
8. **Polyethylene Encasement:**
 - Polyethylene tube wrap shall be furnished for all Ductile Iron Pipe. In addition to the factory applied asphaltic and zinc coating, all buried ductile iron pipe and fittings shall have a tube-type polyethylene encasement in accordance with AWWA C105. Polyethylene encasement shall be 4 mils thick and cross-laminated. Both ends of the pipe shall be thoroughly sealed with adhesive tape or plastic tie straps at the joint overlap. Place circumferential wraps of tape at 2-foot intervals along the barrel of the pipe to minimize the space between the encasement and the

pipe. Pipe shall be wrapped with V-BIO Enhanced Polyethylene Encasement in accordance with manufacturers recommendation.

- Tape of polyethylene tube shall be plastic backed adhesive tape, Polykan #900 or Scotchrap #50 or equal, 2" in width.

2402.2 VALVES

All valves and valve appurtenances shall be factory applied fusion bonded epoxy coated which meets AWWA C550 and bolts shall meet ASTM F-593-95 and nuts ASTM F-594-91.

- A. **Gate Valves:** Buried gate valves shall be iron body, non-rising stem resilient seat gate valves. Valves shall meet the requirements of AWWA C509 or AWWA C515, shall be fusion bonded epoxy coated per AWWA C550 and shall have mechanical joint or flanged ends. Valve opening direction shall be consistent with operation of existing valves in the waterworks in which the valves are installed, unless otherwise directed by the Engineer. The following manufacturers will be permitted: Mueller Company, U.S. Pipe Company, American Pipe Company, Clow Valve, and M&H Valve Company. All body bolts to be stainless steel.
- B. **Butterfly Valves:**
 1. Butterfly valves shall be of the tight-closing, rubber-seat type, shall have a rated pressure of 200 psi. and shall be bubble-tight at this pressure with flow in either direction. Valves and operators shall meet the requirements of ANSI A21.11/AWWA C504 for "Rubber-Seated Butterfly Valves." The following manufacturers are permitted: Henry Pratt Company and Mueller Company.
 2. Buried butterfly valves shall have mechanical joints or flanged. Mechanical joints shall meet the requirements of ANSI A21.11/AWWA C111. Butterfly valves installed above ground or in structures shall have flange joints as specified in AWWA C504. Nuts, bolts, and gaskets for flange joints shall meet the requirements of ANSI A21.10/C110. Nuts and bolts for mechanical joints shall be 304 Stainless Steel. Nuts shall be hexagon nuts and Teflon coated. Bolts shall be tee-head bolts. Nuts and bolts shall meet the requirements of ANSI A21.11/AWWA C111. Gaskets shall be full face and shall be red rubber, or equal.
 3. Each buried butterfly valve or valve in a vault shall have a manual operator and a 2-inch operating nut. Valve opening direction shall be consistent with operation of existing valves in the waterworks in which the valves are installed, unless otherwise directed by the Utilities Engineer.
 4. Each butterfly valve installed above ground shall have a manual operator and handwheel.
- C. **Pressure-Reducing Valves:** Pressure-reducing valves shall be designed to provide tight shutoff under conditions of no flow and shall not "hunt" under ordinary flow conditions. Pressure-reducing valves shall be suitable for operation under the pressure and flow conditions as shown on the plans.
- D. **Combination Air Valves:** Combination air-release and vacuum-relief valves shall be installed at the locations indicated on the plans. Each valve assembly shall be installed complete with appropriate piping and valves as shown on the plans. All piping and isolation valves shall be brass except for the air outlet from the valve which shall be brass or copper tubing. The following valves, or

approved equal, shall be used Valmatic Model 101S, 102S, 103S or Cla-Val 36 Series, or approved equal.

- E. **Tapping Valves:** Tapping valves shall be 200 psi, iron body, resilient-seated gate valves with nonrising stems conforming with all applicable requirements of ANSI/AWWA C500 and C509, except that the outlet and inlet end shall be standard mechanical joint end conforming to ANSI A21.11/AWWA C111.
- F. **Check Valves:**
 1. Swing check valves 3" and larger shall conform to and be tested in accordance with the AWWA Standard for Swing-Check Valves for Ordinary Water Works Service, AWWA C508. They shall be horizontally mounted, single disc, swing type with a full diameter passage providing minimum pressure loss. Valves shall be non-slamming with an outside lever and weight or a spring loaded lever. Disc faces and seat rings shall be bronze. Ends shall fit the pipe or fitting to which attached (push-on, mechanical, bell and spigot, or flanged). The following makes will be permitted: Crane, Darling, Mueller, or equal.
 2. Check valves 2.5" in size and smaller for irrigation systems shall conform to the requirements of Federal Specification WW-V-51a for Class "A" 125 Pound Bronze Check Valves (for land use), Type IV.
- G. **Valve Appurtenances:**
 1. **Valve Ends:**
 - Valve ends of the mechanical joint type shall conform to ANSI A21.11/AWWA C111.
 - The end flanges of flanged valves shall conform in dimensions and drilling to ANSI B16.1 for cast-iron flanges and flanged fittings, Class 125. The laying lengths of the flanged valves shall conform to the dimensions of ANSI B16.10.
 2. **Valve Operation:**
 - Gate valves shall be equipped with a 2" square wrench nut and the direction of rotation to open the valve shall be to the left (counterclockwise) unless otherwise noted in the Special Conditions.
 - Operators for non-buried service butterfly valves shall be of the enclosed gear-type furnished with a handwheel and 2" operating nut. Operators for buried service shall be equipped with mechanical stop-limiting devices to prevent over travel of the disc in the open and closed positions.
 - Valve position indicators shall be furnished for buried butterfly valves. The valve indicator shall be water-tight for installation inside a cast-iron valve box and shall show valve-disc position, direction of rotation, and number of turns from full-open to full-close. All working parts must be constructed of non-metallic and indestructible materials with a clear see-through cover.
- H. **2-Inch and Smaller Valves:** Buried valves 2" and smaller valves for private water services shall meet the applicable requirements of AWWA C800, ASTM B-62 for 85-5-5-5 composition bronze, and USAS B2.1. Valves shall be Mueller H-10283N or equal.

2402.3**VALVE BOXES**

Valve boxes for butterfly valves and gate valves shall be cast iron. Valve boxes shall be two piece or three piece type. Each two piece box shall be complete with bottom section, top section, and cover. Each three piece box shall be complete with base, center section, top section, and cover. Valve boxes shall be extension type with slide or screw type adjustment. Each base and bottom section shall be the proper size for the valve served. Each valve box assembly shall be the proper length for the valve served. The minimum thickness of metal shall be 3/16". Cast the word "WATER" in each valve box cover.

2402.4**FIRE HYDRANTS**

- A. **General:** Fire hydrants shall be dry barrel, standard compression, two-piece standpipe, break-away design conforming to AWWA C502 and shall comply with the following:
 - 1. Two 2½" hose nozzles and one 4½" steamer nozzle, 5¼" minimum mechanical valve opening left and a 6" inlet connection.
 - 2. Hydrants shall be equipped with two drainholes and provided with an automatic and positively operating noncorrodible drain or dip valve so as to drain the hydrant completely when the main valve is shut.
 - 3. Harnessing lugs shall be furnished with the hydrants.
 - 4. Hydrant models permitted are Mueller A423, American Darling B62B or B84B, Clow Valve Medallion, and East Jordan Model 5CD250.
 - 5. Hydrants shall be painted red.
 - 6. Nuts and bolts for hydrants shall be 304 Stainless Steel. Nuts shall be hexagon nuts and Teflon coated. Bolts shall be tee head bolts. Nuts and bolts shall meet the requirements of ANSI A21.11/AWWA C111. The fire hydrant shoe shall be fusion-bonded epoxy coated and lined which meets AWWA C550.
- B. **Nut Dimensions:** Operating stem and nozzle cap nuts shall be 1½" point to flat pentagon.
- C. **Nozzle Threads and Caps:** Hydrant nozzles shall meet NFPA standard thread requirements. All nozzle caps shall be equipped with chains attached to the hydrants and shall be furnished with long life rubber gaskets meeting rubber products in automotive application, ASTM D2000 requirements.
- D. **Bury Depth:** The bury length of hydrant barrel shall be 4' finish grade to the invert of the connecting pipe. Extensions may be used to accommodate pipes at greater depths.

2402.5**VALVE VAULTS**

- A. Air release, meter, and pressure-reducing valve vaults shall be precast concrete conforming to ASTM C478. Access lid castings shall be as shown on the Standard Drawings.
- B. Vaults which, by their special nature, must be cast in place shall conform to the plans and specifications in Section 2201.

2402.6**TRENCHING MATERIAL**

- A. The trench design for pipe shall be in accordance with these specifications and Norman's Standard Construction Drawings, unless approved by the Utilities

Engineer.

1. *Bedding* – The bedding shall be at least 4 inches thick immediately below the pipe. If trench is dry, bedding shall be 4 inches of sand. If wet, material shall be 4 inches of coarse aggregate No. 57 or 67 per ODOT 701.06.
 2. *Haunching* - The Haunching layer shall extend from the bedding layer to 50% of the diameter of the pipe, or the spring line. The material shall be sand.
 3. *Initial Backfill* – The Initial Backfill layer shall extend from the Haunching Layer to 12 inches above the top of the pipe. The material shall be sand.
 4. *Select Backfill* – The Select Backfill layer shall extend to 12 inches above the Initial Backfill. In non-paved areas, the material shall consist of Select Fill. In areas under existing or proposed paved areas, the material shall be Standard Backfill Material.
 5. *Final Backfill* – The Final Backfill layer shall extend from the Select Backfill layer to the final grade.
- B. **Standard Backfill Material** – Material shall conform to Coarse Aggregate Type A per ODOT 703.01 or recycled concrete meeting the same gradation requirements.
 - C. **Sand** – Material shall conform to Class C Bedding Material per ODOT 703.06 B(2) Filter Sand or ODOT Table 703.11.
 - D. **Coarse Aggregate** – Material shall conform to No. 57 or 67 per ODOT 701.06.
 - E. **Select Fill** – Material shall consist of excavated materials screened to contain no rocks larger than 2-inches.
 - F. **Flowable Fill** (Controlled Low-Strength Material or CLSM) – Material shall be in accordance with ODOT 701.19 with at least 20lb/yd³ of Portland cement in the mix design.

2402.7 CONCRETE

Cast-in-Place concrete used for thrust blocks, encasements, and structures shall conform to the requirements of Section 2201.

2402.8 CONDUIT PIPE

Conduit (casing) pipe shall be used where required at railroad or highway crossings or as specified on the plans. The conduit pipe shall be in accordance with Section 2202 and meet the requirements of the railroad or highway authority with regard to type of material, wall thickness, and coating. No conduit will be installed without the approval of the involved highway or railroad authority.

2402.9 TRACER WIRE AND WEATHERHEAD

- A. Tracer wire shall be #12 AWG solid copper wire with 30 mil HDPE coating; DurAtrace \DT-B3021-(500), or approved equal. For directional drilling installation, the contractor shall use #8 Copper Head Solo Shot Extra-High Strength Tracer Wire or approved equal.
- B. All underground splices shall include waterproof connectors; Dryconn #22 - #6 AWG Direct Bury Silicon Filled Tub w/Strain Relief (DBSR) or approved equal, with silicon sealant.

- C. Contractor shall test installed tracer wire to demonstrate the integrity of the installation to allow for future use of the system for maintenance staff to locate the line. Contractor shall use 512 Hz (or similar) line locating equipment for testing.
- D. Contractor shall place all weatherheads at valve boxes, fire hydrants, meters, and blow off valves.
- E. Tracer system shall be properly grounded utilizing a magnesium anode per manufacturer's requirements.

2403 CONSTRUCTION DETAILS

2403.1 GRADING AND EXCAVATION

- A. **Scope:** Excavation and trenching work shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary or required; protection of adjacent property; and other appurtenant work.
- B. **General:**
 - 1. Excavation and trenching work shall be performed in a safe and proper manner according to OSHA regulations and suitable precautions being taken against all hazards.
 - 2. The Contractor shall explore and expose any and all obstructions in advance of excavation so that minor changes in grade and alignment may be made.
 - 3. In paralleling present water and gas mains, the Contractor shall protect all service connections and shall arrange to furnish service to the consumers without interruption. When necessary, Contractor shall notify customers at least 48 hours advance of any anticipated interruption. All outages must be coordinated and approved by the Utilities Engineer.
 - 4. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage.
- C. **Classification of Excavated Material:** No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.
- D. **Blasting:** Blasting is not permitted.
- E. **Unauthorized Excavation:** Any part of the trench excavated below grade shall be corrected with material accepted by the Engineer, placed and compacted by the Contractor.
- F. **Removal of Water:**
 - 1. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry

during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

2. All excavations for concrete structures or trenches which extend down to or below static groundwater elevations shall be dewatered by lowering and maintaining the groundwater surface beneath such excavations a distance of not less than 12" below the bottom of the excavation.
 3. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.
 4. The Contractor is responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
 5. All dewatering shall be incidental to other items of work and shall be provided at no cost to the City.
- G. **Sheeting and Shoring:** Except where banks are cut back on a stable slope, excavation for structures and trenches shall be properly and substantially sheeted, braced, or shored per OSHA requirements as necessary to prevent caving or sliding, to provide protection for workmen and the work, and to provide protection for existing structures and facilities. Sheeting, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure and shall be rigid, maintaining shape and position under all circumstances.
- H. **Stabilization:** Trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen. Trench bottoms which are otherwise solid but which become mucky on top due to construction operations shall be reinforced with one or more layers of crushed stone or gravel. Not more than ½" depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon.
- I. **Trench Excavation:**
1. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block, or 300', whichever is shorter, shall be the maximum length of open trench ahead of pipe laying unless by written permission of the Engineer. Contractor shall not have open trench more than 100' behind pipe laying or one block, whichever is less. Paving and surface restoration shall commence a maximum of one month after initial trenching activities begin.
 2. Except where tunneling or boring and jacking is specified and shown on the plans by the Engineer, all trench excavations shall be open cut.
 3. Stones found in the trench shall be removed for a depth of at least 6" below the bottom of the pipe.
- J. **Alignment and Grade:** The alignment and grade or elevation of the pipeline shall be as shown on the plans. The Contractor must maintain a constant check on the pipe alignment and trench depth and will be held responsible for any deviations therefrom.

K. Minimum Cover:

1. Except where otherwise shown, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover of 30" over the top of the pipe or with sufficient insulation to prevent freezing. Greater pipe cover depths may be necessary on existing pipe, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades.
2. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finish grade or pavement surface elevations.

L. **Unauthorized Trench Widths:** When, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum permitted in the Standard Details, either pipe of adequate strength, special pipe embedment, or arch concrete encasement, as required by loading conditions and as determined by the Engineer, shall be furnished and installed by and at the Contractor's expense.

M. **Trench Bottom in Earth:** The trench in earth shall have a flat bottom the full width of the trench and shall be excavated to the grade to which the pipe is to be laid. The surface shall be graded to provide a uniform bearing and continuous support for each pipe at every point along its entire length. Pipe shall not be laid on trench bottom unless otherwise indicated by the Engineer.

N. **Bedding:** The Contractor shall use granular material (Class I or Class II bedding) in the trench bottom which shall be spread and the surface graded to provide a uniform bearing with continuous support along each section of pipe.

O. Rock Exploration:

1. Unless shown otherwise shown on the plans or noted in the Special Conditions, no rock exploration has been made. On those projects where rock exploration has been made, test holes have been drilled at locations and intervals as shown on the plans or subsurface information report to determine the approximate location and depth of rock. Resistance to penetration was assumed to be "solid rock."
2. This information is furnished for general reference purposes only. The Contractor must form his own opinion as to the character of materials which will be encountered from an inspection in the ground, from his own investigation of the test hole information, or from such other investigations of the test hole information, or from such other investigations as he may desire.

P. **Trench Bottoms in Rock:** All rock excavation shall be carried to a minimum of 4" below the bottom of the pipe. Standard bedding material shall be used to restore the trench bottom to the desired elevation and grade and to provide a uniform bearing and continuous support for the pipe along its entire length. Care shall be exercised to prevent any portion of the pipe from coming to bear on solid rock or boulders.

Q. Mechanical Excavation:

1. The use of mechanical equipment will not be permitted in locations where its operations would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand-excavating methods shall be used.

2. Mechanical equipment used for trench excavation shall be of the type, design, and construction, and shall be so operated that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from the bottom of the trench, and that trench alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.
 3. All mechanical trenching equipment, its operating conditions, and the manner of its operations shall be subject at all times to the approval of the Engineer.
- R. **Stream Crossings:** Stream crossings shall be made in accordance with these specifications and as shown on the plans. The trench width shall be as required for proper pipe installation and the trench depth shall be as required to give minimum cover shown on the plans. Pipe encasement, where required, shall be in accordance with the specifications and placed as indicated on the plans. The construction of grouted riprap for erosion prevention of ditch slopes will be required at locations shown or designated on the plans.
1. *Above water crossings:* The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement in accordance with OAC specifications.
 2. *Underwater Crossings:* A minimum cover of 4' shall be provided over the pipe. The restraint length shall begin and end at least 10-feet horizontally from the top of the creek bank or the next pipe joint, whichever is greater. When crossing water courses which are greater than 15' in width, the following shall be provided:
 - The pipe shall be of special construction, having flexible watertight joints.
 - Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject flooding; and the valve closest to the supply source shall be a manhole.
- S. **Highway and Railroad Crossings:**
1. The Contractor shall make highway and railroad crossing in accordance with these specifications, the Special Conditions, and as shown on the plans.
 2. All construction or work performed and all operations of the Contractor, his employees, or his subcontractors within the limits of highway or railroad right-of-ways shall be in conformity with all the requirements and regulations, and be under the control (through the Engineer) of the authority owning or having jurisdiction over and control of the right-of-way.

2403.2

PIPE INSTALLATION

- A. General:
1. Laying of pipe; installation of valves and hydrants; and embedment and backfill shall conform to the following specifications and the details as shown on the plans.
 2. Whenever pipe laying is stopped, the open end of the line shall be sealed

with a watertight plug which will prevent trench water from entering the pipe.

3. Where the pipe is to be installed inside a conduit (casing) pipe, casing insulators or spacers shall be specifically designed to adequately support and electrically isolate the carrier pipe withing the casing pipe under all conditions. Insulators or spacers shall consist of pre-manufactured stainless steel bands with plastic lining and plastic runners. Insulators shall fit snug over the carrier pipe and position the carrier pipe approximately in the center of the casing pipe, to provide adequate clearance between the carrier pipe bell and the casing pipe. Fasteners for insulators shall be stainless steel or cadmium plated. The number and location of casing insulators or spacers shall be determined by the manufacturer to protect carrier pipe from damage.
4. The Contractor must make every effort to prevent entry of foreign matter into the pipeline during construction.
5. A solid clay dam (trench plug) is required every 400 feet along water line, per the Standard Detail.

B. Polyvinyl Chloride (PVC) Pipe:

1. *Handling:* Pipe, fittings, and other accessories shall at all times be handled with care to avoid damage. Under no circumstances shall they be dropped. Pipe fittings shall be handled as specified for ductile-iron pipe. Any damaged pipe shall be rejected.
2. *Cutting Pipe:* All pipe shall be cut with a saw or special cutting tool. Cutting shall be done in a neat manner without damage to the pipe. Cuts shall be smooth, straight and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed and beveled. Beveling shall be done with a specifically designed beveling tool. Hand beveling will not be allowed. When cutting pipe with couplings, mark the field cut pipe end the same distance in as the mark appeared on the original full-length pipe section.
3. *Cleaning:* The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted.
4. *Pipe Laying:* PVC pipe shall be installed in strict accordance with the requirements and instructions of the pipe manufacturer. It shall be protected from lateral displacement and deflection by pipe embedment material installed as specified for pipe embedment and as shown on the Standard Drawings. No pipe shall be laid under unsuitable trench conditions. Pipe shall be joined in the ditch. Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug which will prevent trench water from entering the pipe.
5. *Tracer Wire:* Install tracer wire and weatherhead on PVC pipe in accordance with City's Standard Details.

C. Ductile Iron Pipe:

1. *Handling:* Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in a sound, undamaged condition. Equipment,

tools, and methods used in unloading, reloading, hauling, and laying pipe and fittings shall be such that the pipe, pipe coatings, and fittings are not damaged. Hooks shall not be used. Under no circumstances shall pipe or accessories be dropped or dumped. Pipe on which the cement lining has been broken or loosened shall be replaced by the Contractor.

2. *Cutting Pipe:* Ductile iron pipe shall be cut with either a saw or an abrasive wheel. Cutting of existing cast iron pipe shall be done with either a saw or abrasive wheel, or when there is a free end, with mechanical pipe cutters. The cutting of pipe with a torch will not be permitted. Cutting shall be done in a neat manner without damage to the pipe, or the cement lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners.
3. *Cleaning:* The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted. Such surfaces shall be wire brushed, if necessary, wiped clean, and kept clean until jointing is completed.
4. *Inspection:* Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective, damaged, or unsound pipe and fittings shall be rejected and marked as such and removed from the site of the work.
5. *Alignment of Bell-and-Spigot Pipe:* Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the 50% of allowed joint deflection as indicated in ANSI/AWWA C600.
6. *Pipe Laying:* Pipe shall be protected from lateral displacement by pipe embedment material installed as specified. Under no circumstances shall the pipe be laid in water, and no pipe shall be laid under unsuitable trench conditions. Pipe shall be joined in the ditch. Whenever pipe laying is stopped, the open end of the line shall be sealed with a watertight plug which will prevent trench water from entering the pipe.

2403.3

JOINTING

A. Push-on Joints:

1. The gasket seat in the bell shall be wiped clean after which the gasket shall be placed. A thick film of lubricant shall be applied to all of the inner surface of the gasket and on the spigot end of the pipe. The lubricant and the gaskets shall be as recommended and supplied by the manufacturer of the pipe being used. The lubricant shall be odorless, tasteless, nontoxic, and suitable for use in potable water.
2. Field-cut pipe shall be bevel filed to remove any sharp or rough edges which might otherwise damage the gasket.

B. **Mechanical Joints:** The mechanical joint shall be used only when shown on the plans.

C. **Flanged Joints:** When bolting flanged joints, care shall be taken to ensure that there is no restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or which would cause unnecessary stress

in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bell-and-spigot joints shall not be packed or assembled until all flanged joints affected thereby have been tightened. Bolts shall be tightened gradually and at a uniform rate so that gasket compression is uniform.

- D. **Restrained Joints:** Restrained joints and anchoring joints shall be installed in strict accordance with the pipe manufacturer's recommendations.

2403.4

CONNECTION TO EXISTING MAINS

- A. The Contractor shall furnish and install all fittings necessary to join the existing and new water mains as shown on the plans and/or call for in the Proposal. Service connections will not be allowed to any mains larger than 12" unless approved by the Utilities Engineer.
- B. The City shall be given at least 24 hours notice prior to turning off any water supply mains. The Contractor shall coordinate tie-ins with the City to minimize down time. Fire hydrants that are temporarily out of service must be either bagged and labeled to indicate they are not in use. In addition, the Contractor shall hang door knockers in the work area to advise citizens of work to be performed.

2403.5

POLYETHYLENE ENCASEMENT

- A. **General:** Polyethylene encasement shall be installed on ductile iron pipe and fittings when indicated on the plans and/or called for in the Proposal.
- B. **Installation:** The polyethylene encasement shall be installed as specified in "Method A" or "Method B" below.
1. *Method A:* Polyethylene tubing shall be approximately 24" longer than the length of the pipe section to provide a 12" overlap on each adjacent pipe section. Tube ends shall be taped in place.
 2. *Method B:* Polyethylene tubing shall be 12" shorter than the length of the pipe section with a 36" length of polyethylene tube centered over pipe joint and lapped over pipe section and its tubing. Tube ends shall be taped in place.
 3. *Repairs:* Any rips, punctures, or other damages to the polyethylene shall be repaired with adhesive tape or with a short length of polyethylene tube cut open, wrapped around the pipe, and secured with adhesive tape.

2403.6

SETTING VALVES, FITTINGS, AND HYDRANTS

- A. Valves and Fittings:
1. All valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner heretofore specified for cleaning, laying, and joining pipe, except that large valves may require special support so that the pipe will not be required to support the valve weight.
 2. Each valve shall be inspected before installation to ensure that all foreign substances have been removed from within the valve body, and shall be opened and closed to see that all parts are in first-class working condition. Gate valves shall be set vertical in the horizontal pipeline. Valves and pipe shall be supported in such a manner as to prevent stress in either with no deflection in the valve/pipe joint.

3. Valve boxes and lids shall be installed at each valve and shall be supported and maintained centered and plumb over the operating nut of the valve. The valve box shaft shall not transmit shock or stress to the valve. Install valve box covers flush with the surface of the finished area.
4. All bends and tees shall be provided with thrust blocks of plain concrete, as specified. All dead ends on new mains shall be closed with plugs or caps suitably restrained to prevent blowing off under test pressure.

B. Hydrants:

1. All new hydrant installations shall be as shown on the plans or Standard Drawings and shall include all necessary excavation and backfill to make the installation complete.
2. Each hydrant shall be inspected before installation for direction of opening, nozzle size and threading, nozzle caps and chains, operating nut, and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow and weep hole openings, and handling damage and cracks. Defective hydrants shall be corrected or replaced.
3. All hydrants shall stand plumb. The weep holes of the hydrant shall be kept clear and free to drain. The areas around each hydrant and hydrant valve shall be thoroughly compacted to prevent settlement of these areas. Weep holes shall be surrounded by 1½" washed rock as shown on Standard Drawing W 09.
4. Hydrants shall be set to a grade that allows their proper operation. Traffic hydrants with breakaway joint must be set with the joint above the ground line. Hydrants behind curbs shall be placed with the hydrant centerline at least 3' from the back of curb of fire lanes and streets. Hydrants shall be rotated so as to have the pumper nozzle facing the street or rotated to face any direction as required by the Engineer.

2403.7

THRUST RESTRAINT

- A. **Hydrants:** Restrained joints shall be utilized with a valve and hydrant tee as shown on the Standard Drawings. Concrete thrust blocking is not required, unless anchored couplings cannot be used.
- B. **Fittings:** All plugs, caps, tees, bends, and other fittings, unless otherwise specified, shall be provided with reaction blocking or suitably restrained joints as shown on the plans or Standard Drawings.
- C. **Thrust Blocks:** Vertical and horizontal reaction blocking shall be 2500 psi concrete as specified herein. Thrust blocks shall be installed between solid ground and the fitting to be restrained. Concrete shall be located to contain the resultant thrust force and permit access to pipe and fitting joints for repairs.
- D. **Restrained Joints:** Restrained push-on or mechanical joints, mechanical joint anchoring fittings (Megalug) or approved equal and mechanical joints utilizing set screw ductile iron retainer glands may be used in lieu of concrete thrust blocking if so indicated on the plans or accepted by the Engineer. Megalug or approved equal restrained joints shall be used on all sizes which are available and shall be fusion bonded epoxy in accordance with AWWA C116.
- E. All thread, when used in thrust restraint, shall be stainless steel conforming to ASTM F-593-95.

2403.8

EMBEDMENT AND BACKFILLING

- A. **Pipe Embedment:** Embedment for pipe shall be in accordance with these specifications and details of the laying condition as indicated on the plans or Standard Drawing W01.
- B. **Trench Fill:** Backfill for the entire length of the pipeline shall be compacted full depth of the trench above the embedment.
1. Compacted backfill shall be finely divided job-excavated material free from debris, organic material, frozen materials, and stones larger than 6" in greatest dimension. Masses of moist, stiff clay shall not be used.
 2. Whenever, in the opinion of the Engineer, the material excavated from the trenches is not suitable for backfilling, or there is a deficiency of material suitable for backfilling, the Contractor shall provide suitable material. The Contractor shall remove all excess excavated materials and shall dispose of them at locations provided by the Contractor.
 3. At the option of the Contractor, compacted backfill may be either job-excavated material or standard bedding material.
 4. Backfill in streets and driveways shall be accomplished entirely with granular bedding or flowable fill as shown on the Standard Drawings.
- C. **Placement and Compaction:**
- Job-excavated materials shall be placed in uniform layers not exceeding 8" in uncompacted thickness. Increased layer thickness may be permitted for noncohesive material if the Contractor demonstrates to the satisfaction of the Engineer that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.
 - Granular bedding used for backfill shall be placed in uniform layers not exceeding 6" and compacted by slicing with a shovel or vibrating.
 - Compaction of trench backfill shall be the following percent of maximum density at optimum moisture content as determined by the Standard Proctor Test, ASTM D698:

Area	Cohesive Materials	Cohesionless Materials
Non-paved	85%	90%
Paved	Not Allowed	95%

(Refer to Standard Drawings)

- D. Backfill failing to meet required densities shall be removed or scarified and recompact as necessary to achieve specified results.
- E. Special backfilling will be allowed in new residential subdivisions or other development approved by the City Engineer. If trench settlement occurs within the maintenance bond period, the contractor shall fill and compact the settlement area, and repair property damaged by the settlement to the satisfaction of the City Engineer.
- F. Warning tape shall be installed above all new and rehabilitated underground piping after placement of select backfill as detailed on Standard Drawing W-01.

The tape shall be installed approximately 24 inches above the top of pipe. The tape shall be 2 to 3 inches wide and made of materials not subject to decay or breakdown in the environment where it is installed. Tape shall be colored “blue” for water lines and shall be permanently marked “**CAUTION: BURIED WATER LINE BELOW**”.

2403.9 **DISINFECTION AND TESTING**

The Contractor shall cause all new waterlines and appurtenances to be flushed, pressure tested, and disinfected with safe bacteriological samples obtained prior to placing the improvements into service. The order of completion for initial flushing and disinfection may vary dependent upon the disinfection methodology chosen.

- A. **Initial Flushing:** After installation, the Contractor shall flush the constructed improvements by obtaining a water velocity of a least 3.0 ft/sec. Flushing shall be carried out long enough to remove a minimum of 2.5 times the volume of the pipeline being flushed, or longer as necessary to obtain turbidity-free water from all discharge points along the main. The following table specifies the minimum blow-off diameter for typical water line sizes. For water lines sizes not included in the table, the Contractor is to provide the calculations demonstrating that the minimum velocity is achieved.

Water line blow-off minimum flushing diameter, see table below.

Pipe Diameter	Minimum Blow-Off Diameter
8-inch or smaller	FH unless approved by Engineer
12-inch	FH unless approved by Engineer
16-inch and larger	16-inch open ended pipe

- B. **Subsequent Flushing:** If the water line needs to be flushed more than once, the contractor shall be charged for the cost of the water, labor and additional testing used after the first flushing. The City will calculate said cost, which shall be paid before the project is accepted by the city. Costs will be based on current water rates. This applies to capital projects and subdivision development water lines.
- C. **Disinfection:**
1. The Contractor must make every effort to prevent entry of foreign matter into the pipeline during construction.
 2. The Contractor shall disinfect the constructed improvements in a manner acceptable to the City and in conformance with the requirements of the ODEQ and AWWA C651. The improvements may be disinfected by introducing a chlorine solution into the water line after initial flushing or by placing granular calcium hypochlorite (intended for use in water pipes only) into the water line as it is constructed. The new water line shall be disinfected by using a concentration of free chlorine not be less than 50 mg/l nor more than 100 mg/l.
 3. The following table provides the approximate amount of granular calcium hypochlorite (typically 65% free chlorine) needed to produce a concentration of 50 mg/l per 100 feet for common diameters of water line. The Contractor must comply with the requirements of initial flushing after disinfection of the water line.

Approx. Granular Calcium Hypochlorite Required to Produce
50 mg/l Concentration in 100' of Pipe

Pipe Diameter (inches)	100 % Chlorine (pounds)	65% Chlorine (pounds)
4	0.027	0.042
6	0.061	0.094
8	0.108	0.168
12	0.240	0.377
16	0.436	0.670
24	0.875	1.507

(adapted from Table 6-6, Handbook of Chlorination, Clifford White, 1999)

4. When the Contractor chooses to disinfect by introducing a sodium hypochlorite solution into the water line, the solution shall be fed after initial flushing at a constant rate until the entire water line is filled with highly chlorinated water. The following table provides the approximate amount of 1% chlorine solution needed to produce a concentration of 50 mg/l per 100 feet for common diameters of water line.

Approximate Sodium Hypochlorite Solution Required to Produce
50 mg/l Concentration in 100' of Pipe

Pipe Diameter (inches)	One Percent Chlorine Solution (Gallons)
4	0.33
6	0.73
8	1.30
12	2.93
16	5.22
24	11.75

(adapted from Table 6-6, Handbook of Chlorination, Clifford White, 1999)

5. The highly chlorinated water shall be retained in the water line and appurtenances for at least 24 hours. All valves, hydrants and other appurtenances in the section treated shall be operated in order to disinfect the appurtenances.
6. The Contractor will provide suitable locations for bacteriological sampling. The City will collect water samples after the initial 24 hour disinfection period on two (2) consecutive days and have the samples tested by ODEQ or other ODEQ certified laboratory.
7. At the end of the disinfection periods, the treated water in all portions of the waterline shall have a residual of not less than 10 mg/l free chlorine. A residual of less than 10 mg/l shall cause the disinfection procedure to be repeated for that section of line.
8. Water line and appurtenances shall be flushed of all highly chlorinated water prior to placing in service. The highly chlorinated water shall be dechlorinated or disposed of by the Contractor in accordance with applicable Federal or State regulations without damage to public or private property.

9. The disinfection procedure shall be repeated should the initial treatment fail to yield satisfactory results.
- D. Hydrostatic Testing:
1. The Contractor will complete the hydrostatic pressure and leakage testing. In the event of a test failure, the Contractor is responsible to locate and make any and all repairs to the water line improvements to achieve an acceptable test result.
 2. Preparation: The distribution line may be tested without the taps installed. Prior to starting the test, the Contractor will flush the line of all dirt and debris. The Contractor will also evacuate all air from the water line. This will be coordinated with the Project Inspector and the Line Maintenance Division of the Utilities Department. Potable water to perform hydrostatic testing will be made available by the City at no charge to Contractor. All other water for construction shall be the responsibility of the Contractor.
 3. The City, with Contractor assistance, shall perform hydrostatic pressure and leakage tests in accordance with AWWA C600 procedures. Where practicable, mains shall be tested in lengths between line valves or plugs of no more than 1,500 feet in length unless approved by the Utilities Engineer.
 4. Conduct test at a pressure of 150 psi measured at the highest point of the water line. Duration of the test shall be not less than two hours. Maintain test pressure ± 5 psi throughout the duration of the test.
 5. All visible leaks at exposed joints and all leaks evident on the shall be repaired by the Contractor regardless of leakage test results. All pipe, fittings, valves, and other appurtenances found to be defective shall be removed and replaced at the Contractor's expense.
 6. Water lines which fail to meet test requirements shall be repaired until the test requirements are met.
- E. Inspection Requirements: The Contractor is responsible to ensure the Project Inspector is on site to observe and document all required testing.

2403.10 SURFACE RESTORATION

- A. **Seeding and Sodding:** If noted on drawings, all unpaved areas disturbed or damaged during the work shall be sodded by the Contractor, in accordance with Section 2104. Seeding may be allowed as approved by the Engineer.
- B. **Sidewalks and Driveways:** All paved sidewalk and driveway areas damaged during the work shall be replaced by the Contractor. Repairs shall conform to the lines and grades of the original pavement and shall be equal to, or better than, the quality, thickness, and appearance of that removed. Sidewalk and driveway replacement shall conform to the requirements of Section 2205.
- C. **Streets and Curbing:** All paved street, shoulder, and curbing areas cut by the line of trench or excavation or damaged during the work shall be replaced by the Contractor. Repairs shall conform to the lines and grades of the original pavement and shall be equal to or better than, the quality, thickness, and appearance of that removed. Paving and curb replacement shall conform to the requirements of Section 2205.

2403.11 FIRE LINES

- A. Water lines providing fire protection or fire suppression capabilities shall be constructed in accordance with the requirements of Section 2400 and applicable sections of National Fire Protection Association (NFPA). Where these requirements are contradictory, the more restrictive requirement will apply.
- B. All water lines to be dedicated to the City shall be installed in a dedicated right-of-way or utility easement. Utility easements for water lines shall have a minimum width of 15 feet and will be granted by the property owner, accepted by the City of Norman and filed at the county court house prior to acceptance of the work.
- C. The diameter of the water line shall be determined by the design engineer and shall accommodate the proposed project needs as well as existing fire protection needs in the area where the connection is made. Dedicated fire lines shall be at least 6 inches in diameter unless otherwise approved by the City. Fire flows shall not cause the line pressure in the surrounding area to be less than 25 psi. If determined necessary by the Engineer, the developer shall install any additional off-site improvements to ensure a minimum pressure of 25 psi is maintained during fire flows.
- D. A check valve and appurtenances with valve vault, in accordance with the Fire Line Standard Drawing, shall be installed in close proximity to the point where the fire line connects to the domestic water system. The vault will be oriented outside of the right-of-way or any utility easements. Representatives of Line Maintenance and the Fire Department must approve, in writing, drawings showing the layout and location of all fire line vaults prior to construction. For dead end fire line connections and privately owned looped fire lines the Contractor shall provide vaults, valves, and piping in accordance with the City's Standard Details.
- E. Fire lines shall not be tapped for domestic or irrigation water use after the check valve.

2404 WATER MAINS NEAR SEWERS

2404.1 HORIZONTAL SEPARATION

- A. Water mains shall be located at least 10 feet horizontally from any existing or proposed sewer lines, storm sewers, raw water lines, oil and gas lines, and buried electric lines. In cases where it is not practical to maintain a 10 foot separation, the ODEQ may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water line closer to a sewer line, provided that the water main is in a separate trench.
- B. PVC water lines shall be located at least 50 feet horizontally from any gasoline storage tank. Wherever a 50 foot separation cannot be maintained for water lines, ductile iron pipe must be used for the water line but in no case shall be closer than 10 feet to the storage tank. The distance shall be measured edge to edge.
- C. Water lines shall be located at least 50 feet from all parts of septic tanks and adsorption fields, or other sewage treatment and disposal systems. In cases where the 50 foot separation cannot be maintained, written approval from the Utilities Engineer shall be obtained. A minimum of the 15 feet shall be always maintained. ODEQ may allow deviation on a case-by-case basis.

2404.2 CROSSINGS

Sewers crossing water lines shall be laid to provide a minimum vertical distance of 24 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is

either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far away as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main and so sewer line joint shall be less than 9 feet from water lines.

2404.3 SPECIAL CONDITIONS

When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to water pipe and shall be pressure tested to assure water tightness prior to backfilling. The sewer shall be designed and constructed in accordance with ODEQ 252:656.

2404.5 SEWER MANHOLES

No water line shall pass through, or come in contact with, any part of a sewer or a sewer manhole.

2405 MEASUREMENT AND PAYMENT

2405.1 SCOPE

This section covers the methods of measurements, and the basis of payment, for the furnishing of all labor, equipment, tools, and materials and for the performance of all related work necessary to complete any construction covered in Section 2400.

2405.2 GENERAL

Unless specifically altered by the Special Conditions, the methods of measurement and payment will be as specified herein, and as listed in the Proposal (Bid Schedule).

2405.3 ITEMS NOT LISTED IN THE PROPOSAL

There will be no measurement or separate payment for any items of work not specifically identified and listed in the Proposal and all costs pertaining thereto will be included in the Contract Unit Prices for other items listed in the proposal.

2405.4 MEASUREMENT AND PAYMENT

The quantities of accepted work will be measured and paid for on a unit price basis determined as follows:

- A. **Pipe:** Payment shall be made at the unit price bid per linear foot of pipe of the size and type specified in the Proposal and placed as shown on the drawings. Total footage shall be the actual measurement along the centerline of the pipe. No additional payment shall be made for trench excavation, backfilling, including embedment and backfill material as specified, right-of-way clearing and restoring, polyethylene wrap if called out by the Engineer, vertical pipe or for fittings or specials included as pipe for concrete blocking or thrust restraint.
- B. **Fittings:** Payment shall be made at the unit price bid per fitting type specified in the Proposal, installed in accordance with the plans, and shall include cost of concrete thrust blocking.
- C. **Conduit (casing):** Measurement will be made in linear feet for the applicable size and type of conduit, bored or trenched, as called for in the Proposal and/or as shown on the plans, based on actual field-measured lengths of acceptably installed conduit (casing), including insulation spray foam, carrier pipe, thrust restraint system, spacers, vent piping, and other subsidiary items per Norman Standard Construction Drawings.
- D. **Valves:** Payment for valves shall be made at the unit price bid per valve, of the type specified on the Proposal, and placed as shown on the Drawings. The unit price bid for air relief, blow off, and check valves shall include the valve vault. No additional payment shall be made for: excavation, backfilling, concrete

blocking, crushed rock for drains, valve boxes, or air relief valve piping in vaults.

- E. **Fire Hydrants:** Payment for fire hydrants and stem extensions of the types specified in the Bid Schedule shall be made at the unit price bid per hydrant and per each different length of extension used. No additional payment shall be made for the pipe length between the existing water line and the fire hydrant except where the pipe is shown on the Drawings in separate profile, valves included in fire hydrant assemble, tee for assembly, backfill or thrust restraint.
- F. **Tapping Sleeve and Valve:** Payment for tapping sleeve and valve shall be made at the unit price per tapping sleeve and valve, of the type and size specified on the Proposal, and placed as shown on the Drawings. The cost of pipe, valve, fittings, closure pieces, hardware, thrust restraint, and all other incidentals necessary for a complete and workable installation are included in this pay item.
- G. **Wet Connection:** Payment for a wet connection shall be made at the unit price per wet connection. The cost of the pipe, fittings, closure pieces, hardware, thrust restraint, and all other incidental items necessary for a complete and workable installation are included in this pay item.
- H. **Short Service:** Payment for a short service shall be made at the unit price per service connection. Short service is defined as a service line that does not cross a roadway between the main and the meter connection. The cost of furnishing all materials, labor, equipment, tools, and all other incidentals necessary for a complete and workable installation are included in this pay item.
- I. **Long Service:** Payment for a short service shall be made at the unit price per service connection. Long service is defined as a service line that crosses a roadway between the main and the meter connection. The cost of furnishing all materials, labor, equipment, tools, and all other incidentals necessary for a complete and workable installation are included in this pay item.
- J. **Specials (Vaults, Special Structures, etc):** Measurement for these type items will be made based on the actual number of units installed, as called for on the plans and as identified in the Proposal.

END OF SECTION 2400

City of Norman
STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

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City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 2500 SANITARY SEWERS

2501 GENERAL REQUIREMENTS**2501.1 SCOPE**

This specification is to govern all work, materials, and testing for the installation of gravity sanitary sewers and pressure pipelines and related items complete, including manholes, junction chambers, diversion chambers, services, and miscellaneous concrete structures.

2501.2 ABBREVIATIONS

Wherever the words, forms, or phrases herein defined or pronouns used in their stead occur in these specifications, in the contract or in the Advertisement of any document or instrument herein contemplated or to which these specifications apply, the intent and mean shall be interpreted as defined in Sections 1008 and 1009.

2501.3 CODES, SPECIFICATIONS, AND STANDARDS

Codes, specifications, and standards referred to by title or number shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply in all cases. Specific reference standards include:

- A. Title 252. Oklahoma Administrative Code, Chapter 656, Water Pollution Control Facility Construction Standards, ODEQ
- B. Wastewater Collection Systems Management, MOP 7, WEF
- C. Code of Ordinances, City of Norman

2501.4 SUBMITTALS

Before construction and preferably before fabrication, the Contractor shall submit to the Design Engineer for review calculations on the thickness or strength class and drawings showing pipe lengths, joints, and other construction and installation details. All pipe, fittings, coatings, materials, and structures furnished under this Contract shall be fabricated only in accordance with the drawings and these specifications.

2501.5 QUALITY ASSURANCE

- A. **Performance Tests:** The Contractor shall test all gravity sewers constructed under the Contract. The Contractor shall constantly check horizontal and vertical alignment. Testing for vertical deflection in the case of non-rigid pipe and sewer watertightness testing in the case of all gravity sewers and hydrostatic testing of pressure (force main) pipe shall be as specified in Section 1006. If one or more sections of the sanitary sewer as-built information reflect that the slope does not meet ODEQ standards for minimum grade, the pipe must be replaced, or a variance must be requested by Utilities Engineer and approved by ODEQ before the City of Norman will accept the improvements.
- B. **Line and Grade Requirements:** The Contractor shall provide assurance to the Utilities Engineer that the sewer is laid accurately to the required line and grade as shown on the drawings. The Contractor shall utilize a laser beam instrument to lay and check the alignment and grade between manholes. Before proceeding with the next section of sewer, the last section shall be checked for proper line and grade. Variations from a uniform line and grade as shown on the drawings and described below shall be cause for the line to be rejected.

- C. Over-sizing sanitary sewer lines for purpose of complying with minimum grade requirements is not allowed unless documentation of compliance with minimum velocity of 2 feet per second at design average daily flow for sewer segment in question is provided and approved by the Utilities Engineer.

2501.6 RELATION TO WATER MAIN

- A. See Section 2404.1.A and 2402.1.C. Sewers must be located at least 10 feet horizontally from any existing or proposed water main. The distance is to be measured from wall to wall.
- B. **Crossings:** See Section 2404.2
- C. **Special Conditions:** See Section 2404.3. Should specific conditions prevent this separation, the Contractor shall notify both the Design Engineer and Utilities Engineer for specific instructions regarding the treatment of the separation. Special conditions may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench. It may be necessary to install 150 psi pressure rated pipe and joints as gravity sewer pipe for the congested areas.

2502 PRODUCTS

2502.1 GRAVITY SEWERS 18 INCHES AND LARGER

- A. Polyvinyl Chloride (PVC) Pipe
 - 1. Polyvinyl chloride pipe shall be closed profile pipe and conform to ASTM F679 or ASTM F949 requirements for flattening, impact resistance, stiffness, joint tightness, and extrusion quality.
 - 2. The pipe shall be made of PVC plastic having cell classification of 12454 or 12364.
 - 3. Joints shall be the integral bell type gasketed joint designed so that when assembled, the elastomeric gasket inside the bell is compressed radially on the pipe spigot to form a positive seal. The joint shall be so designed to avoid displacement of the gasket when installed in accordance with manufacturer's recommendations.
 - 4. Pipe entering a manhole shall have a manhole waterstop gasket as supplied by the manufacturer firmly clamped around the pipe at the manhole. If flexible entry type manhole system is used, the waterstop gasket is not required.
- B. High Density Polyethylene Pipe (HDPE)
 - 1. Solid wall High density polyethylene pipe (HDPE) shall meet the requirements of ASTM -F-714 and Ductile Iron Pipe Sizing (DIPS).
 - 2. Solid wall High density polyethylene pipe (HDPE) may be used for slip-lining or pipe bursting installations only in sizes from 18 inches to 48 inches in diameter.
 - 3. Pipe joints shall be by heating and butt-fusion method in strict conformance with the manufacturer's printed instructions and be made by qualified personnel using proper jigs and tools per standard procedures outlined by the pipe manufacturer.
- C. Fiberglass Gravity Pipe

1. Glass-Fiber-Reinforced Thermosetting-Resin Pipe shall be in accordance with ASTM D3262, D4161, and D3567. The minimum pipe stiffness is 46 psi (SN 46) in accordance with ASTM D2412.
2. Pipes must be Type 1, Liner 1 or 2, Grade 1 or 3 per ASTM D3262.
3. Coupling joints must meet the requirements of ASTM D4161.
4. The pipe shall be field connected with flush fiberglass sleeve couplings or flush bell-spigot joints that utilize elastomeric sealing gaskets made of EPDM rubber compound as the sole means to maintain water tightness. The joints must meet the performance requirements of ASTM D4161. Joints at tie-ins may utilize a fiberglass, gasket-sealed coupling.
5. The pipe interior surface must have a glass reinforced liner system or be manufactured using a resin with a minimum 50% elongation when tested in accordance with ASTM D638.
6. Determine the maximum allowable leakage or infiltration by the following formula:

$$L = C \times D \times S / 126,720$$

Where L is the allowable leakage in gallons per hour; S is the length of pipe tested in feet; D is the nominal diameter of the pipe in inches; C is infiltration/exfiltration rate. Use 50 for C outside of 25-year floodplain, and 10 for C within 25-year floodplain.

7. The pipes shall be installed per the manufacturer's recommendations.
8. Approved manufacturers are Hobas USA or Thompson Pipe Group FRP.

2502.2 GRAVITY SEWERS 15 INCHES OR SMALLER:

A. Polyvinyl Chloride Pipe.

1. Polyvinyl chloride pipe shall conform to ASTM D3034 SDR 35 or better, Type PSM.
2. Joints on PVC sewer pipe shall be the integral bell type gasketed joint designed so that when assembled the elastomeric gasket inside the bell is compressed radially on the pipe spigot to form a positive seal. The joint shall be so designed to avoid displacement of the gasket when installed in accordance with manufacturer's recommendations. The joint shall comply with the physical requirements of ASTM D3212, and the gasket shall be the only element depended upon to make the joint flexible and watertight.
3. All PVC Pipe entering a manhole shall have a manhole waterstop gasket as supplied by the manufacturer firmly clamped around the pipe at the manhole. If flexible entry type manhole system is used, the waterstop gasket is not required.

2502.3 FITTINGS:

Fittings such as wyes, tees, and bends shall be made in such a manner as will provide strength and watertightness at least equal to the class of the adjacent main line pipe to which they are jointed and shall conform to all other requirements specified for pipe of corresponding class and internal diameter. Joints shall be of the same type as used on the adjoining pipe. Fittings for sewer taps shall be SDR 26 tees per

the latest revision of ASTM D3034 or Norman Standard Drawings. A stainless steel repair band with a minimum length of 12-inches shall be used for connections. No flexible couplings will be allowed.

2502.4 **FORCE MAINS**

- A. Force mains shall be PVC meeting the requirements of AWWA C900, DR-25 (165 psi), unless otherwise required by the Design Engineer. All PVC force mains shall be colored green and have a tracer wire and warning tape per Norman Standard Drawings.
- B. Contractor shall install a line marking post (supplied by the contractor) every 400 linear feet. Contractor shall install a tracer wire weatherhead (see Section 2502.4.E below) fastened to the line marking post or inside a manhole. Spacing to be approved by Utilities Engineer.
- C. All fittings must be ductile iron and shall have factory applied fusion bonded epoxy coated (interior and exterior) which meets AWWA C116. The epoxy coating shall be installed per the coating manufacturers specifications. A Certificate of Compliance shall be required from the coating manufacturer stating that the coating meets all requirements mentioned herein. Holiday testing shall be required per ASTM G 62. The epoxy coating and the factory that applies the coating shall be approved by the Utilities Engineer.
- D. Valves
 - 1. ***Eccentric Type Plug Valves:*** Plug valves shall be nonlubricated eccentric type with resilient faced plugs having mechanical joint or flanged ends.
 - 2. Port areas of valves shall be 100% of full pipe area.
 - 3. Valve seats, valve plug stem sleeves and plug stem bushings shall be fabricated of materials which are corrosion and abrasive resistant. The corrosion resistance shall be such that exposure over a period of five years to domestic wastewater, industrial wastewater, domestic sludges or industrial sludges containing sulfuric acid, hydrochloric acid, acetic acid, mineral oils, vegetable oils, polymers, esters, or acetones shall not result in sufficient corrosion to interfere with the serviceability of the plug valve.
 - 4. Seals shall be capable of being replaced while the line and valve remain in service, if under submerged conditions, thereby eliminating the need to take process units out of service.
 - 5. All exposed nuts, bolts, springs, and washers shall be stainless steel. Means of actuation shall be by lever, gear actuator, tee wrench, extension stem, or floor stand, as indicated.
 - 6. All plug valves shall be equipped with an underground operator.
 - 7. Plug valves 10-inch and larger shall be equipped with gear actuators. All gearing shall be enclosed and lubricated with seals provided on all shafts to prevent entry of dirt and fluid into the actuator. All shaft bearings shall be furnished with permanently lubricated bronze bearing bushings. Actuator shall clearly indicate valve positions, and an adjustable stop shall be provided to set closing torque. Valve stop shall be positive and shall not move due to repeated operation of the valve.
 - 8. Plug valves shall be DeZurik Series 100, Henry Pratt Ballcentric, Crispin Style 800, or approved equal.

9. **Gate Valves:** Buried gate valves 4-inch and larger shall be iron body, non-rising stem gate valves. Valves shall meet the requirements of ANSI/AWWA C509 and shall have mechanical joint ends. Mechanical joints and joint accessories shall meet the requirements of ANSI/AWWA A21.11/C111. Valve opening direction shall be consistent with operation of existing valves in the utility in which the valves are installed, unless otherwise directed by the Utilities Engineer. The following manufacturers will be permitted: Mueller Company, U.S. Pipe Company, American Pipe Company, Clow Valve, and M&H Valve Company.
10. Check Valves:
- Where swing check valves are specified, they shall conform to and be tested in accordance with the AWWA Standard for Swing-Check Valves for Ordinary Water Works Service, AWWA Designation C508. They shall be horizontally mounted, single disc, swing type with a full diameter passage providing minimum pressure loss. Valves shall be of the non-slamming type designed for the future installation of outside lever and weight. Disc faces and seat rings shall be bronze. Ends shall fit the pipe or fitting to which attached (push-on, mechanical, bell and spigot, or flanged). The following makes will be permitted: Crane, Darling, Mueller, or equal.
 - Where ball type check valves are specified, the valve shall consist of just three components: body, cover and ball - one moving part. The design of the valve shall be such that it keeps solids, stringy material, grit, rags, etc., moving without the need for back flushing. The ball shall clear the water way providing "full flow" equal to the nominal size. It shall be non-clog. The ball shall be hollow steel with an exterior of nitrile rubber, it shall be resistant to grease, petroleum products, animal and vegetable fats, diluted concentrations of acids or alkalis (pH 4-10), tearing and abrasion. The body and cover shall be of gray cast iron, Class 35. Flange drilling shall be according to ANSI B16.1, Class 125.
 - Check valves 2-1/2 inches in size and smaller shall conform to the requirements of Federal Specification WW-V-51a for Class "A" 125-pound Bronze Check Valve (for land use), Type IV.

11. Sewage Air and Vacuum Valves

Sewage combination air and vacuum valves shall be as follows:

SIZE SPECIFICATION

2" x 1"	Apco No. 401 SC, Val-Matic Co. No. 301 BWA, or equal
2" x 2"	Apco No. 402 SC, Val-Matic Co. No. 302 BWA, or equal
3" x 3"	Apco No. 403 SC, Val-Matic Co. No. 303 BWA, or equal
4" x 4"	Apco No. 404 SC

- E. **Valve Boxes:** Valve boxes for plug valves and gate valves shall be cast iron. Valve boxes shall be two piece or three piece type. Each two piece box shall be complete with bottom section, top section, and cover. Each three piece box shall be complete with base, center section, top section, and cover. Valve boxes shall be extension type with slide or screw type adjustment. Each base and bottom section shall be the proper size for the valve served. Each valve box assembly shall be the proper length for the valve served. The minimum thickness of metal shall be 3/16 inch. Valve box cover shall have wording "Sewer" cast in it.

F. Air and Vacuum Valve Chambers

1. Air and vacuum valve chambers shall be 6 foot diameter precast concrete manhole barrels with precast concrete flat slab tops. Precast manhole barrels shall meet the requirements of ASTM C478.
2. Air and vacuum valve chamber access frames and cover shall be in accordance with as Norman Standard Drawings

G. **Tracer Wire:** The tracer wire shall be one #12 AWG solid copper wire with 30 mil HDPE coating; DurAtrace \DT-B3021-(500), or approved equal. For directional drilling installation, the contractor shall use #8 Copper Head Solo Shot Extra-High Strength Tracer Wire or approved equal.

1. All underground splices shall include waterproof connectors; Dryconn #22 - #6 AWG Direct Bury Silicon Filled Tub w/Strain Relief (DBSR) or approved equal, with silicon sealant.
2. Contractor shall test installed tracer wire to demonstrate the integrity of the installation to allow for future use of the system for maintenance staff to locate the line. Contractor shall use 512 Hs (or similar) line locating equipment for testing.
3. Contractor shall attach tracer wire to weatherhead or manhole/vault ring.

2502.5 **MANHOLES AND OTHER STRUCTURES:**

A. MATERIALS:

1. Materials for manholes, junction chambers, diversion chambers, and miscellaneous concrete structures shall comply with the following:
2. Precast manhole sections shall conform to requirements of ASTM C478.
3. Concrete for precast manhole sections shall be 3,500 psi concrete. Monolithic manholes shall use 4,000 psi concrete. Ready-mix concrete shall conform to ASTM C94 Alternate 2. Maximum size of aggregate shall be 1½ inches. Slump shall be between 2 inches and 4 inches.
4. Forms for chamber and structures shall be plywood or other accepted material. Steel forms shall be used for the inside face of monolithic concrete manholes.
5. Reinforcing steel shall conform to ASTM A615, Grade 40 deformed bars, or ASTM A616, Grade 40 deformed bars.
6. Mortar Materials
 - Sand - ASTM C144, passing a No. 8 sieve.
 - Cement - ASTM C150, Type 1.
 - Water - shall be potable.
7. All joints shall be fully sealed and waterproofed. Rubber gaskets for precast concrete manhole sections shall meet the requirements of ASTM C443. The gasket shall be the sole element depended upon to make the joint flexible and watertight.
8. The manufacturer of the precast manholes shall provide core-drilled openings to produce a smooth, uniform, cylindrical hole of the proper size

to accommodate a resilient connector meeting the requirements of ASTM C923 for all sewer pipes entering and leaving the manhole. The approved connectors are Press-Seal Gasket Corp. (PSX gasket or Press Wedge II), Kor-N-Seal by NPG Systems, Inc., Z-LOK Connector by A-LOK Products, or approved equal.

9. All manhole casting shall comply with Section 2502.5A.1(i) of the Norman Standard Specifications and shall be ASTM A48 ductile iron and be made in the USA. Covers shall be solid with two (2) pickbars; vents or pick holes are not allowed. Manufacturer shall certify that all castings are manufactured and proof load tested in accordance with AASHTO M306 (latest version). Weight of the ring and cover shall be approximately 375 lbs. Additionally, rings and covers shall have the foundry name and production date (mm/dd/yy). Manhole covers shall include the lettering "CITY OF NORMAN", "SANITARY SEWER", and "DANGER – CONFINED SPACE" permanently cast into the street side surface. Castings without proper markings shall be rejected. Castings shall be EJ Model 2100, or Neenah R-1682 (Deeter 1159), or equal approved prior to bid.
10. Bolted ring and cover, where required, shall include at least three (3) one-inch (1") openings equally spaced around the rings. Furnish and install one-half inch (1/2") stainless steel (SST) anchor bolts and nuts in openings. Cover shall also have machined groove with one-quarter inch (1/4") diameter Neoprene Gasket.
11. Any other special manholes, junction chambers, diversion chambers, and miscellaneous concrete structures shall be constructed as detailed on the drawings.
12. Manhole Inverts shall be constructed as to provide a minimum drop of 0.1 feet from the incoming pipe invert to the outgoing pipe invert, unless otherwise approved by the Utilities Engineer.

2502.6 PIPE EMBEDMENT MATERIALS

- A. Standard bedding material shall consist of 4-inches of Type A aggregate base per Norman Standard Drawings. If the trench is wet or directed by the Utilities Engineer, the material shall be 4-inches of No. 57 or 67 rock per ODOT Section 701.06.
- B. Flowable fill shall be as specified in Section 2402.6.B.
- C. Concrete for embedment and encasement shall have a compressive strength of 3,500 psi at 28 days.
- D. One (1) clay plug or water dam is required between each manhole. The plug or dam shall be the full width of the trench, five (5) feet long, and extend a minimum of 24 inches above the top of the pipe.

2502.7 CONDUIT PIPE

Conduit (casing) pipe shall be used at railroad or highway crossings or where required by the Utilities Engineer. The conduit pipe shall be in accordance with Section 2202 and meet the requirements of the railroad or highway authority with regard to type of material, wall thickness, and coating. No conduit will be installed without the approval of the involved highway or railroad authority.

2503 SITE PREPARATION

2503.1 GENERAL

- A. Contractor shall do all cleaning necessary for performance of his work and shall confine his operations to that area provided through easements, licenses, agreements, and rights-of-way. The Contractor's entrance upon any lands outside of that area provided by easements, licenses, agreements or public rights-of-way, shall be at the Contractor's sole liability.
- B. The Contractor shall not occupy any portion of the Project Site prior to the date established in the Notice to Proceed without prior permission of the Utilities Engineer.

2503.2 OBSTRUCTIONS

- A. **General:** Natural obstructions, existing facilities and improvements encountered during site preparation shall be removed, relocated, reconstructed or worked around as herein specified. Care shall be used while performing site preparation work adjacent to any facilities intended to remain in place. Except as otherwise specified, the Contractor shall be responsible for any damage to existing facilities and improvements and any repairs required shall be promptly made at the Contractor's expense. Waste materials shall be disposed of in a satisfactory manner off the work site. Restoration of utilities damaged by the Contractor shall be restored as directed by the utility company at no additional cost to the Owner. Unless otherwise provided in the Special Conditions or Proposal, no separate or additional payment will be made for any work in connection with removal, relocation or restoration of obstructions and existing facilities.
- B. Surface Obstructions
 - 1. Sidewalks, curb and gutter, drainage structures and similar obstructions shall be tunneled under if tunneling is best suited, otherwise the obstruction shall be, cut- in straight lines or removed to the nearest construction joint if located within five feet of the centerline of the trench. In no case shall the joint or line of cut be less than one foot outside the edge of the trench. Surface obstructions removed to permit construction shall be reconstructed as specified and to the dimensions, lines and grades of original construction.
 - 2. Mailboxes shall be maintained in the manner that the Postal Service requires to prevent interruption of mail delivery.
 - 3. Site preparation shall include where necessary and permitted the removal of trees, shrubs, brush, crops, and other vegetation within the limits of the easements (right-of-way) or as may be provided for in licenses, permits and agreements. The following procedures for protection of existing greenery are required.
 - Trees:
 - All reasonable effort shall be made to save as many trees as possible. Trees are defined as six inches in diameter and greater when measured at a point three feet above the ground surface. If trees can be saved by trimming, this shall be done in accordance with acceptable pruning practices.
 - All trees within easements or right-of-way provided, which are specifically to be removed or saved have been marked on the plans.

Trees to be removed shall be completely removed, including stump and large roots, unless such removal may result in damage to existing pipelines. In that event, trees shall be sawn off not more than 4 inches above the ground and the stump shall be removed to 12 inches below finish grade. Any tree replaced shall be outside the right-of-way or sewer easement and shall be like species of nursery stock.

- *Small Plants and Flowers:* At least two weeks prior to the start of construction, property owners shall be notified by the contractor of the proposed starting date. The purpose of this notification is so that the property owners can remove any small plants or flowers that they, the property owners, desire to save.
4. Fences interfering with construction and located within public rights-of-way or as may be allowed for in permits or agreements, may be removed by the Contractor only if the opening is provided with a temporary gate that will be maintained in a closed position except to permit passage of equipment and vehicles unless otherwise herein specified. Fences within temporary construction easements may be removed by the Contractor provided that temporary fencing is installed in such a manner as to serve the purpose of the fencing removed. The contractor shall locate and record all fence corners prior to removal. All fencing removed shall be restored by the Contractor to the condition existing prior to construction unless otherwise specified in the Special Conditions. The Contractor is and shall be solely liable for the straying of any animals protected or corralled or other damage caused by any fence so removed.
 5. The Contractor shall preserve all property corners, pins or markers. In the event any property corners, pins, or markers are removed by the Contractor, such property points shall be replaced at the Contractor's expense and shall be reset by competent surveyors properly licensed to do such work. In the event such points are section corners or Federal land corners, they shall be referenced and filed with the appropriate authority.
 6. Sodded and/or landscaped thoroughfares and areas on or adjacent to improved property shall be disturbed only to the extent required to permit construction. Such areas shall not be used as storage sites for construction supplies and insofar as practicable shall be kept free from stockpiles or excavated materials.

C. Subsurface Obstruction:

1. Where existing utilities and service lines are to be encountered, the Owner thereof shall be notified by the Contractor at least 48 hours (not including weekends and/or holidays) in advance of performing any work in the vicinity. All excavation, pipeline installation and backfilling work in the vicinity of such utilities shall be accomplished in the manner required by the respective Owner and, if requested, under their direct supervision. The Contractor shall be responsible for any and all damages to a public or private utility that may occur as the result of the construction.
2. The Contractor shall make a reasonable effort to ascertain the existence of obstructions and shall locate obstructions by digging in advance of machine excavation where definite information is not available as to their exact location. Where such facilities are unexpectedly encountered and damaged, responsible officials and other affected parties shall be notified

and arrangements made for the prompt repair and restoration of service.

3. The Contractor shall make every reasonable effort to protect private sewer facilities. They are not shown on the Plans. When these facilities are disturbed or damaged by the work, the Contractor shall make necessary repairs to the facilities for continuous service prior to the close of the workday.

2504 EXCAVATION

2504.1 SCOPE

Excavation and trenching work shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection; preparation of subgrades; pumping and dewatering as necessary or required; protection of adjacent property; and other appurtenant work.

2504.2 GENERAL:

- A. All pipeline excavation work shall be accomplished under supervision of a person experienced with the materials and procedures which will provide protection to existing improvements, including utilities and the proposed pipeline.
- B. The alignment, depth, and pipe subgrades of all sewer trenches shall be determined by laser beam or other electronic equipment.
- C. When pipe is to be installed in embankment or fill, the embankment shall be constructed and completed in accordance with Section 2100. Once the embankment or fill is complete and stabilized, the pipe may be installed. The top of the embankment or fill shall be built up to a plane at least 18 inches above the top of the proposed pipe prior to the excavation of the sewer trench.
- D. The Contractor shall not open more trench in advance of pipe laying than is necessary. The maximum length of open trench allowed on any line under construction shall be 300 feet. All open trenches shall be adequately protected.
- E. The Contractor shall remove surplus pipeline materials, tools, rubbish and temporary structures and leave the construction site clean, to the satisfaction of the Construction Inspector.
- F. In the event hazardous wastes as defined by the Resource Conservation and Recovery Act of 1976 (PL94-580) are encountered, work shall be halted, and the Utilities Engineer shall be notified. Work shall be resumed only after the Utilities Engineer notifies the Contractor. Regulation of removal, handling and disposal of hazardous wastes is the responsibility of Federal and State agencies.

2504.3 CLASSIFICATION OF EXCAVATED MATERIAL

No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling regardless of the type, character, composition, or condition thereof.

2504.4 REMOVAL OF WATER

- A. The Contractor shall remove any water that may accumulate or be found in the trenches and other excavations made under the Contract.
- B. The Contractor shall form all dams, flumes or other works necessary to keep the excavation clear of water while the sewers and their foundations, and other foundation works, are being constructed. All water shall be removed from such

excavation in a manner that will not damage property.

- C. All dewatering shall be incidental to other items of work and shall be provided at no cost to the City.

2504.5 *BLASTING*

Blasting is not permitted.

2504.6 *TRENCH EXCAVATION*

- A. Excavations for pipelines, except where boring or jacking is specified, shall be accomplished by the open-cut method (trenching) except as specified or accepted by the Utilities Engineer. Trenching shall be with a minimum inconvenience and disturbance to the general public. One block, or 300 feet whichever is shorter, shall be the maximum length of open trench ahead of pipe laying unless otherwise accepted by the Utilities Engineer. The Contractor shall sort and stockpile the excavated material, so the proper material is available for backfill.
- B. All trenches shall be excavated to depths required for proper pipe embedment. Over-depth excavation shall be required when the subgrade is unstable. Over-depth excavations shall be backfilled with granular pipe embedment material unless otherwise directed by the Utilities Engineer.
- C. Undercutting of trench walls is not permitted.

2505 *INSTALLATION OF PIPE*

2505.1 *SCOPE*

This section governs construction methods and procedures for the installation of gravity and pressure pipelines and appurtenances.

2505.2 *GOVERNMENTAL REQUIREMENTS*

Sanitary sewer line installation shall comply with applicable Federal, State, and County Environmental Quality Departments requirements.

2505.3 *TRENCH DEWATERING:*

- A. Contractor shall maintain a dry and stable trench, obtain necessary permits, and provide for the proper method of discharging such water from the work site at all times until pipeline installation is completed to the extent that hydrostatic pressure flotation or other adverse effects will not result in damage to the pipeline.
- B. Proper dewatering techniques are the Contractor's responsibility. All work performed by the Contractor which is adversely affected by his failure to adequately dewater trenches will be subject to rejection by the Utilities Engineer. The Contractor shall repair and/or replace the affected pipeline without additional compensation.

2505.4 *DRAINAGE COURSE CROSSING ENCASEMENT*

Any pipeline crossing a well-defined drainage course having less than 3 feet of cover over the pipe shall be encased in concrete. The length of encasement shall be as shown on the Plans or if not shown as specified by the Design Engineer.

2505.5 *TRENCH SHORING AND BRACING*

- A. All shoring, bracing or blocking shall be furnished and installed as necessary to preserve and maintain exposed excavation faces, to protect existing improvements, to protect the proposed pipeline and to provide for safety.

- B. Shoring or other methods for support of trench walls is the responsibility of the Contractor and shall be accomplished by methods that will not adversely affect pipeline alignment, grade and/or structural integrity.
- C. All bracing, sheeting and/or shoring installed below a horizontal plane 6 inches above top of proposed pipe shall not be disturbed or removed after pipe and/or pipe embedment has been installed unless otherwise specified. The bottom skids of a trench shield shall not extend lower than 6 inches above top of proposed pipe.

2505.6**PIPE EMBEDMENT:**

- A. All concrete embedment for rigid pipe shall begin and end at a pipe joint.
- B. Pipe shall be embedded with standard bedding materials in accordance with Section 2502.6.

2505.7**BEDDING INSTALLATION:**

- A. The trench subgrade shall be prepared to provide a uniform and continuous pipe support between pipe bells and joints.
- B. Place and densify embedment material by shovel slicing or vibrating and prepare embedment material so that the pipe will be true to line and grade after installation.
- C. After each pipe has been brought to grade, aligned, and placed in final position, deposit and densify by shovel slicing sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe, jointing, bedding, and backfilling operations. Place bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
- D. Place pipe that is to be bedded in concrete embedment in proper position on temporary supports consisting of wood blocks or bricks with wood wedges. When necessary, anchor or weight the pipe to prevent flotation when the concrete is placed.
- E. Place concrete for embedment or encasement uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than 5 feet from its point of placement.
- F. If unstable subgrade conditions are encountered and it is determined by the Utilities Engineer that the bedding specified will not provide suitable support for the pipe, additional excavation to the limits determined by the Utilities Engineer will be required. This additional excavation shall be backfilled with material accepted by the Utilities Engineer.

2505.8**BEDDING MATERIAL:**

- A. **Concrete Cradle or Encasement:** Concrete for embedment shall have a minimum 28-day strength of 3,500 psi except as otherwise specified. After initial set of concrete, 12 inches of backfill material should be placed over the conduit or concrete. The backfill above this point shall not be placed nor sheeting removed until at least forty-eight (48) hours after placement of the concrete. Time requirements may be adjusted by the Utilities Engineer to obtain structural integrity.
- B. **Granular Embedment:** The pipe shall be bedded in granular material, as shown as per Norman Standard Drawings.
- C. **Flowable Fill:** Flowable Fill shall be a sand-cement slurry consisting of 2,970 lbs

of sand, 100 lbs of cement, and approximately 458 lbs of water per cubic yard. The slurry will be mixed to a pourable soupy mix in a ready mix truck. When the flowable fill is to be a Quick-Set flowable fill, the cement shall be replaced with a rapid set cement and the slurry shall have a strength of 65 to 75 psi in 1 to 1.5 hours.

2505.9 *TEES, WYES AND BUILDING SERVICE LINES:*

- A. Building service lines from the main to the building shall be considered private.
- B. Tees, wyes and saddles shall be installed at forty-five (45) degrees with pipe springline for pipe sizes 8 inches through 15 inches diameter. Tees, wyes and saddles shall not be installed in pipe sizes greater than or equal to 18 inches diameter. Saddles shall be DFW Flexible Saddle or approved equal.
- C. Building service lines of 4 inches or less shall be installed with a straight alignment and at a uniform grade not less than one (1) percent unless otherwise specified and shall be embedded with granular bedding material. Service line depth shall be based on service line stub out 0.5 feet below surface, 1% minimum grade and a minimum of 26 inches from finished floor elevation to top of service line. When a building service line grade exceeds twenty (20) percent, pipeline anchors shall be installed with the first anchor not more than 12 feet nor less than 7 feet upstream of the tee or wye.
- D. The Contractor shall maintain an accurate record for submittal to the Utilities Engineer of location, size and direction of each tee, wye, saddle and/or location, size and length of each building service line. Locations shall use the pipeline stationing as shown on the Plans or the distance from the first downstream manhole. If the City provides video of the tap location, the Contractor will be responsible for the City's cost to televise the sewer, in which the fee is to be assessed by the City.
- E. Service lines shall be terminated and capped as shown as per Norman Standard Drawings.

2505.10 *GRAVITY SEWERS:*

- A. All gravity sewers shall be installed to the alignment, elevation, slope, and with pipe embedment as specified and/or shown on the Plans. Maintain the following tolerances from true alignment and grade between adjacent manholes:

Alignment	6 inches
Grade	1 inch

- B. Gravity pipe must be laid straight and to the grade specified. No joint deflection will be allowed. For Force Mains, joint deflection requirements shall conform with Section 2403.2.

2505.11 *PRESSURE SEWERS (FORCE MAIN):*

- A. All pressure sewers shall be installed with required pipe embedment to depths shown on the Plans and in accordance with as per Norman Standard Drawings. The pipe shall be installed at a continuous slope unless indicated otherwise on the Plans
- B. Accepted air relief valves shall be installed at all locations shown on the Plans or where required by the Utilities Engineer.
- C. The Contractor shall block and anchor the pipeline or use restrained joints to

accommodate thrust and testing forces at pipe deflections, bends, tees, and plugs in accordance with as per Norman Standard Drawings.

2505.12 ANCHORS

- A. Pipelines shall be anchored every 16 feet when the slope is greater than 20%.
- B. The anchor shall be of concrete or other material accepted by the Utilities Engineer. Concrete anchors shall have a minimum thickness of 12 inches. The anchor shall extend not less than 12 inches into undisturbed earth on the sides and bottom and (12 inches) above top of pipe. In incompressible material, the above dimensions may be 6 inches each side and bottom. The anchor shall support a joint fitting.

2505.13 PIPE LAYING:

- A. All pipe shall be installed in accordance with the pipe manufacturer's recommendations, except as modified herein.
- B. Pipe laying shall not proceed if the trench width as measured at the top of pipe exceeds the maximum allowable trench width. If this occurs, the Contractor shall submit to the Utilities Engineer for review a better bedding for the pipe or pipe of sufficient strength to provide safe supporting strength.
- C. All pipe and fittings shall be stored and handled with care to prevent damage thereto. Hooks shall not be used to transport or handle pipe or fittings. Pipe or fittings shall not be dropped.
- D. Rejected pipe and fittings shall be marked and removed from the Project Site at no cost to the Owner. All pipe and fittings shall be examined for soundness and specification compliance prior to placement in the trench and rejected pipe or fittings shall not be incorporated into the pipeline. Pipe class or strength shall be checked to assure that proper pipe is installed.
- E. Joint contact surfaces shall be cleaned prior to jointing. Lubricants, primers, or adhesives shall be used as recommended by the pipe or joint manufacturer.
- F. Pipe laying normally shall begin at the lowest point. A minimum earth cover of 30 inches shall be provided for all sewers.
- G. Unless otherwise required, all pipes shall be laid straight vertically and horizontally between manholes, excavating bell holes for each pipe joint. When jointed, the pipe shall form a true and smooth pipeline.
- H. Pipe connecting to a structure shall be supported with concrete embedment, cradle or encasement to the first joint outside the structure excavation. If flexible wall connections are used, standard bedding may be used in lieu of concrete embedment provided the height of backfill does not exceed the covers depths, which would result in loads exceeding the pipe's safe supporting strength.
- I. All pipelines shall be plugged at the end of each day's progress. Plugs or other positive methods of sealing shall be utilized at all times to protect any existing, system from entrance of stormwater or other foreign matter.
- J. When a sanitary sewer line crosses an existing pipeline and the clearance is less than 2 feet, special embedment may be required.

2505.13 CONNECTION OF PIPES OF DISSIMILAR MATERIALS:

The connection of pipes of different materials shall be made using a non-shear stainless steel band or approved equal and shall provide a permanent and watertight connection that will withstand the hydrostatic test pressure.

2506 BACKFILL

2506.1 *GENERAL:*

- A. All trash and debris shall be removed from the pipeline excavation prior to backfilling.
- B. Unless otherwise specified, all sewer trenches and excavation around structures shall be backfilled to the original surface of the ground with suitable earth or earth and rock. When an earth and rock mixture is used, it shall be placed and thoroughly consolidated with sufficient earth to completely fill all voids between the rocks.
- C. The backfill material shall be placed in lifts not to exceed 4 feet in depth. Each lift shall be compacted to the required density prior to the next lift being placed.
- D. Sand backfill shall not be used for gravity sewer lines.
- E. In areas marked "garden" or "flower garden," the original topsoil shall be replaced to original elevation and depth. Minimum depth shall be 12 inches.
- F. Backfill material shall be carefully placed to avoid damage to or displacement of the pipe and other exposed utilities or structures.
- G. Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction. Contractor shall remove waste material, trees, organic material, rubbish, or other deleterious substances.
- H. No rock whose greatest dimension exceeds six inches shall be placed within 4 feet of the top of the pipe in any excavation as backfill. No rock greater than one foot in its largest axis shall be placed in any trench excavation as backfill.
- I. Special backfilling procedures will be allowed in new residential subdivisions or other development and will not be under a proposed driving surface, with approval of the Utilities Engineer. The select fill and final backfill can be backfilled in one lift. The backfill shall be compacted from the top of the trench by driving acceptable heavy equipment over the trench. If trench settlement occurs within the maintenance bond period the contractor shall fill and compact the settled area with acceptable material and repair the area with sod if necessary.
- J. Warning tape shall be installed above all new and rehabilitated underground piping installed by open trench after placement of select backfill as detailed on Norman Standard Drawings. The tape shall be installed approximately 18 inches above the top of pipe. The tape shall be 2 to 3 inches wide and made of materials not subject to decay or breakdown in the environment where it is installed. Tape shall be colored "green" for both gravity sewers and pressure force mains and shall be permanently marked "CAUTION: BURIED SEWER LINE BELOW."

2506.2 *BACKFILLING UNDER PAVEMENT*

Under areas to be paved, the backfill materials (ODOT 703.01, Type A Aggregate) from the top of the pipe embedment shall be compacted in such a manner so as to obtain 95% of maximum density as determined by ASTM D698. The backfill material shall extend a minimum of 2-feet behind the back of curb, or the edge of pavement where no curb exists. Required compaction and percentage of maximum density must be obtained before pavement is placed.

2506.3 *BACKFILLING IN UNPAVED AREAS*

From the top of the pipe embedment to a point at grade the backfill material shall be compacted to no less than 90% of maximum density for cohesionless and 85% for cohesive soils, per Norman Standard Drawings as determined by ASTM D698.

2506.4 BACKFILL AROUND STRUCTURES

- A. No backfill shall be placed over or around any structure until the concrete or mortar has attained a minimum strength of 3,500 psi and can sufficiently support the loads imposed by the backfill without damage.
- B. The Contractor shall use utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement of the structure. Any damage caused by premature or unbalanced backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.
- C. No rock larger than 4 inches maximum dimension shall be placed within 12 inches of the exterior surface of any structure.

2507 RESTORATION

2507.1 GENERAL

The Contractor shall restore the project site to conditions equal to or better than those existing prior to entry unless otherwise specified.

- A. Maintain adequate safety signs, barricades and lights until final restoration of work area is completed.
- B. Public property shall be restored to the requirements of the public body having jurisdiction.

2507.2 CLEAN-UP

The Contractor, upon completion of installation and backfill operations, shall prepare the area for final grading including but not limited to the following items:

- A. Clean-up shall follow the backfilling operations as closely as possible.
- B. Excess material shall be removed from the site including material that has washed into the stream beds, storm water facilities, streets, etc.
- C. Tools, equipment, and construction material shall be removed except for in designated storage areas along the pipeline route.
- D. Restore surface and sub-surface drainage and provide temporary wash checks where necessary.

2507.3 FINISHED GRADING:

The Contractor shall finish grade the area to lines and grades shown on the Plans or if not shown to those that existed prior to the area being disturbed. Special attention shall be directed to ensure surface drainage. The area shall be smoothed by raking or dragging.

2507.4 SURFACE RESTORATION:

- A. **Seeding and Sodding:** All unpaved areas cut by the line of trench or excavation or damaged during the work shall be sodded when specifically indicated on the plans. Seeding may be installed upon authorization by the Utilities Engineer. Seeding and sodding shall conform to the requirements of Section 2104.
- B. **Sidewalks and Driveways:** all paved sidewalk and driveway areas cut by the line of trench or excavation or damaged during the work shall be replaced. Sidewalk and driveway replacement shall conform to the requirements of Section 2205 and 2304.7.
- C. **Streets and Curbing:** All paved street, shoulder, and curbing areas cut by the line of trench or excavation or damaged during the work shall be replaced to

conform to the lines and grades of the original pavement and shall be of equal quality, thickness, and appearance to that removed. Paving and curb replacement shall conform to the requirements of Section 2205 and 2304.

2507.5 *FENCES*

All fencing damaged and/or removed existing prior to construction shall be restored to a condition not less than that which existed prior to construction.

2507.6 *WALLS*

Retaining and architectural walls, if disturbed or damaged, shall be restored architecturally and structurally to conditions not less than that which existed prior to construction.

2507.7 *TREES, SHRUBS AND BUSHES*

Any tree, shrub or bush replaced shall be planted outside the permanent sanitary sewer right-of-way and shall be of the same species as the removed tree, shrub or bush. Any tree, shrub or bush species that is prohibited by local restrictions shall be substituted with a related species. The contractor shall notify the property owners at least two weeks prior to the start of construction so property owners can remove small plants and flowers.

2507.8 *MANHOLE EXCAVATION*

- A. **Excavation:** Excavation for manholes and special structures shall be governed by this Section and Section 2504. It shall be achieved in a suitable and orderly manner providing a minimum disturbance to the general public.
- B. **Depth of Excavation:** Depth of excavation shall be to that required for proper installation of the manhole or structure. Over-depth excavation may be required by the Utilities Engineer if the subgrade is unstable. Over-depth excavation due to unstable subgrade shall be backfilled as required by the Utilities Engineer. Over-depth excavation occurring through an oversight by the Contractor shall be backfilled as required by the Utilities Engineer at no additional cost to the Owner.
- C. **Side Clearances:** Side clearances outside the manhole and/or structures shall be no greater than to allow for forming, connection of piping, proper application of special coatings, if required, and to permit inspection. When concrete is to be placed directly against excavated faces, excavation shall be sufficiently outside of the manhole or structure to provide not less than 3 inches of concrete cover over the steel reinforcement.

2507.9 *MANHOLE INSTALLATION:*

Manhole installation shall be governed by this Section and Section 2505. It shall be performed by the Contractor on a schedule that will provide an orderly progression of the work.

- A. Bases:
 - 1. Precast bases shall be reinforced in accordance with ASTM C478.
 - 2. If precast bases are not used, poured concrete bases shall be used. Precast bases shall be installed on 6 inches of crushed rock. Depths exceeding this amount shall be filled with concrete.
 - 3. Poured-in-place bases shall have a minimum thickness of 8 inches. When poured-in-place bases are used, the invert shall be poured monolithically with the base. The bottom wall sections shall be embedded in the base section a minimum of 3 inches. The bottom precast wall section shall not be set upon a previously poured base. Solid concrete blocks shall be used for supporting and leveling the wall section prior to pouring the base.

- B. **Inside Dimensions:** The minimum horizontal clear distance in the barrel of the manholes shall not be less than four feet unless otherwise specified on the Plans.
- C. **Precast Manholes:**
1. **Delivery:** Precast concrete components shall not be delivered to the job until representative concrete control cylinders have attained at least 80 percent of the specified minimum design strength.
 2. **Inspection:** Precast concrete shall be inspected when delivered. Rejection of defective or cracked precast concrete components shall be in accordance with ASTM C478.
 3. **Construction:** Precast sections shall be cleaned of all dirt, grass, and other deleterious matter. Seal each joint (including adjustment rings and castings) with a double bead of preformed bitumastic joint sealant. Lift holes shall be patched with non-shrink grout.
- D. **Cast-In-Place Manholes:**
1. **Wall thickness:** Wall thickness shall conform to the dimensions as shown on the drawings.
 2. **Construction:** Reinforcement steel shall be placed as shown on the drawing. Tie-holes shall be patched with non-shrink grout. Wall sleeves, where required, shall be installed as shown on the drawings. Water stops shall be installed at the wall and slab connection and shall be of the size, thickness and material as shown on the drawings.
 3. **Top Slabs:** Thickness shall conform to the dimensions and reinforcement steel shall be placed as shown on the drawings.
 4. **Pipe Stubs:** Stubs shall be installed at the locations, angles, elevations and of the materials as shown on the drawings. A water-tight removable stopper shall be installed in each pipe stub. Pipe stubs shall be installed so that a pipe joint will be 2 feet or less from the outside manhole wall.
 5. **Inverts:** Inverts shall be structural concrete and steel-troweled to produce a dense, smooth finish. The invert channel shall be "U" shaped in cross section and extend upward one-half of the inside pipe diameter. Smooth transitions shall be formed for pipes of different sizes, elevation and bends. The invert bench shall be sloped to drain.
 6. **Top Elevation:** The finished top elevation of manhole castings shall conform to the following unless otherwise shown on the plans or directed by the Utilities Engineer.
 7. **In paved or future paved areas,** the top of the casting shall conform to the slope of the pavement and be 1/8 inch below the finished pavement elevation.
 8. **In non-pavement areas,** the top of the casting shall be not more than 6 inches above the surrounding ground nor less than 0.2 feet above the surrounding ground. The final elevation shall be at a point where storm water will drain away from the manhole cover.
 9. **Manhole Adjustment:** All new manholes will be provided with adjustment ring(s) underneath the casting as shown on the Norman Standard Drawings. The joints shall be sealed with preformed bitumastic sealant.

The maximum allowable adjustment distance between the top of the cone and the bottom of the casting shall be 24 inches. If the top of an existing manhole is required to be raised to an elevation that will exceed the maximum adjustment distance or lowered more than the adjustment rings will allow, all vertical adjustments shall be made to the barrel of the manhole.

10. Castings: Castings shall be installed with the mud ring inserted inside the manhole opening and resting on a minimum of two rows of preformed bitumastic sealer. Bolt-down castings shall be held in place as shown on the Plans.
- E. **Waterproofing:** Exterior protective coating may be required where water infiltration through the concrete is expected and/or if required by the interior lining being provided.
- F. **Linings and Coatings:** Interior protective coating or liner is required on all exposed concrete surfaces on the interior of the manhole, including concrete grade rings. The liner system shall be approved by the Utilities Engineer.
- G. **Manhole Backfilling:** Manhole backfilling shall be governed by Section 2506.
- H. **Restoration:** Restoration shall be governed by Section 2507.4.
- I. **Manhole Testing:** Manholes shall be tested in accordance with Section 1006.7.

2508 MEASUREMENT AND PAYMENT

2508.1 SCOPE

This section covers the methods of measurements, and the basis of payment, for the furnishing of all labor, equipment, tools, and materials for the performance of all related work necessary to complete any construction covered in Section 2500.

2508.2 GENERAL

Unless specifically altered by the Special Conditions, the methods of measurement and payment will be as specified herein, and as listed in the Proposal (Bid Schedule).

2508.3 ITEMS NOT LISTED IN THE PROPOSAL

There will be no measurement or separate payment for any items of work not specifically identified and listed in the Proposal and all costs pertaining thereto will be included in the Contract Unit Prices for other items listed in the Proposal.

2508.4 MEASUREMENT AND PAYMENT

- A. The quantities of accepted work will be measured and paid for on a unit price basis as determined as follows:
 1. **Pipe:** Payment shall be made at the unit price bid per linear foot of pipe of the size and type specified in the Bid Schedule and placed as shown on the drawings. Total footage shall be the actual measurement along the centerline of the pipe to the inside face of connecting structures. No deduction will be made for laying lengths of valves or fittings. No additional payment shall be made for vertical pipe or for fittings or specials included as pipe, joint restraint, right-of-way clearing and restoring, testing, cleanup, or other operations unless identified in the Proposal.
 2. **Polyethylene Wrap:** If called for separately in the Proposal, polyethylene tube shall be furnished and shall be paid for at the unit price bid per linear

foot installed.

3. **Standard Backfill Material (SBM):** If called for separately in the Proposal, payment shall be made at the unit price bid for cubic yards of SBM specified in the Proposal and placed as shown on the drawings. SBM volume estimate is computed on the basis of the length of pipe, trench width, and depth of SBM, less the volume of the pipe installed in the SBM based on the outside diameter (O.D.). Payment will not be made for extra width or depth of trench due to Contractor's workmanship.
4. **Trench Excavation:** If called for separately in the Proposal, payment shall be made at the unit price bid per cubic yard of trench excavation completed according to the Plans and Specifications. Volume will be computed as follows: Standard trench width as given per Norman Standard Drawings; length of line as of the actual horizontal measurement along the centerline of the ditch; depth of excavation in increments of 0-10 feet, 10-15 feet, 15+ feet below ground surface as the actual depth of ditch from the original ground surface to the flow line of the pipe as shown in the construction plans. Average end-area method of computing volume will be used. No measurement for excavation will be made for material excavated outside the neat lines of the standard trench width as given as per Norman Standard Drawings unless included in the Special Conditions or Proposal.
5. **Fittings:** Payment shall be made at the unit price bid per fitting type specified in the Proposal, installed in accordance with the plans, and shall include cost of concrete thrust blocking. This item shall include fittings required for service connections.
6. **Conduit (casing):** Measurement will be made in linear feet for the applicable size and type of conduit, bored or trenched, as called for in the Proposal and/or as shown on the plans, based on actual field-measured lengths of acceptably installed conduit (casing), including insulation spray foam, carrier pipe, thrust restraint system, spacers, vent piping, and other subsidiary items per Norman Standard Construction Drawings.
7. **Valves:** Payment for valves shall be made at the unit price bid per valve, of the type specified on the Proposal, and placed as shown on the Drawings. The unit price bid for air relief and check valves shall include the valve vault and box. If valve box extensions are required, they shall be paid for at the unit price bid per extension if identified separately in the Proposal. No additional payment shall be made for: excavation, backfilling, concrete blocking, crushed rock for drains, air relief valve piping in vaults, or for setting of the valve box or extension.
8. **Manholes:** Payment for manholes shall be made on the basis of units installed and accepted. If the manhole depth, measured from the invert to the top of the cover exceeds 6 feet, the additional depth shall be paid for at the unit price bid per vertical foot of manhole depth over 6 feet.
9. **Specials (Vaults, Special Structures, etc.):** Measurement for these type items will be made based on the actual number of units installed, as called for on the plans and as identified in the Proposal.
10. **Concrete Encasement:** Concrete encasement will be measured by the lineal foot of each size and type.

11. **Seeding:** Measurement and payment will be made in accordance with Section 2105.4.G.
12. **Sodding:** Measurement and payment will be made in accordance with Section 2105.4.F.
13. **Pavement Removal and Replacement:** Measurement will be made in accordance with Section 2207.4.E.

END OF SECTION 2500

City of Norman
STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

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City of Norman
STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

SECTION 3000 PUBLIC WORKS ADMINISTRATION

3001 ADMINISTRATION BY THE PUBLIC WORKS DEPARTMENT

3001.1 INTRODUCTION

This sub-section defines the powers and duties of the Public Works Department and its inspectors, the requirements of permits, the establishment of fee schedules, and penalty provisions for violating City code.

3001.2 CONFLICTING PROVISIONS

When any provision of this Chapter conflicts with any other provision of the Code of the City of Norman, the provisions of this Chapter shall control.

3001.3 DUTIES OF THE PUBLIC WORKS DEPARTMENT

- A. The Public Works Department, under the supervision of the Public Works Director, shall:
 - 1. Make engineering plans and specifications for the physical facilities of the City, and supervise the construction of those facilities,
 - 2. Establish a schedule of inspection and re-inspection fees for those items constructed or installed to adequately reflect not less than the actual costs of the City, and such schedules to be certified by the Public Works Director and filed with the City Clerk.
 - 3. Specifically enforce the provisions of Chapter 16, Chapter 19, Chapter 21, and Chapter 22 of the Code of the City.
 - 4. Promulgate and enforce such rules, regulations, and procedures for the efficient administration of those duties required by this section.

3002 POWERS OF PUBLIC WORKS INSPECTOR

3002.1 INSPECTORS OF THE PUBLIC WORKS DEPARTMENT SHALL HAVE THE POWER AND AUTHORITY TO:

- A. Order the stopping of construction of any installation of storm, sanitary sewer, water or paving improvements if earth change permit or other applicable permits have not been obtained or, if such construction is being done in a careless or reckless manner, or in violation of the provisions of the Code of the City.
- B. Call upon the police and fire departments in enforcing violations of the Code of the City.
- C. Revoke any permit where it is found that there has been a misrepresentation of facts or a violation of the Code of the City.

- D. Order the closing of any streets and the rerouting of traffic when the City of Norman has contracted with any person for the improvement of such street, or that period of time necessary to permit the proper completion of that improvement.

3002.2 APPEALS FROM INSPECTOR'S DECISIONS

- A. Any person aggrieved by an inspector exercising his power and authority pursuant to Section 3001.3, must, before instituting suit, appeal to a Public Works Appeal Board, which shall consist of the Public Works Director, the City Attorney, and a designee of the City Manager.
- B. Any such appeal shall be made within 5 days after the decision of the inspector, and shall be in writing, stating the reasons for the appeal. The date and place of all hearings shall be fixed by the appeal board, and all interested parties shall be given written notice of the hearings.
- C. The appeal board shall give a written decision within 10 days of the hearings, and if accepted by the appealing party, the board shall take such necessary steps as to give effect thereto.

3002.3 INSPECTIONS

- A. Public Works inspectors may enter upon property under development.
- B. All work found to be faulty or incorrectly or defectively installed shall be corrected before any approval shall be given by an inspector, and when such has been corrected, notification for a re-inspection shall then be given to the Public Works Department.
- C. All inspections shall be made by the Public Works Department within two (2) working days from the receipt of the notification for the inspection or re-inspection.
- D. No work which is required to be inspected shall be covered over or covered up prior to that particular inspection, and any covering in place shall be removed upon the order of the inspector.

3002.4 NOTICE

- A. Whenever an inspector exercises his power and authority pursuant to this Section 3001.3 in ordering compliance with the Code of the City, notice shall personally be given to the responsible person or his agent, or sent by certified mail to such person's last known address. If such persons are not personally located and no address is known, the notice shall be posted in a conspicuous place on the premises.
- B. Such notice and order shall:
 - 1. Be in writing
 - 2. List the specific non-compliance with the Code of the City.

3. Specify the action to be taken.
4. Provide a reasonable time for compliance with the Code of the City.

3002.5 PERMITS REQUIRED, EXCEPTIONS

- A. Except as otherwise provided in Subsection B of this Section, no person shall engage in the following acts without having first obtained the necessary permits from the Public Works Department:
 1. The construction, alteration, cutting, mutilation, or changing in any manner for any purpose, any paved or traveled portion of any street or alley or drainage right-of-way, any easement, any curb, gutter, catch basin or other appurtenance of a street or alley, or any sidewalk.
 2. The construction or repair of any off-site improvement.
 3. Any earth disturbing construction activities including developing, grading, excavating, paving, landfilling, berming or diking.
- B. No permit is required under the following circumstances:
 1. Where a public utility corporation installs electrical conductors or equipment in the generation, transmission, sale, or use of electrical energy as outlined in their franchises with the City.
 2. Where the construction, alteration, cutting, and changing of a portion of any street or alley or drainage right-of-way, any easement, any curb, gutter, catch basin or other appurtenance of a street or alley is under the direct supervision of the City Manager or the Public Works Department.
 3. Where such cutting, or changing of a sidewalk is only for the repair of that sidewalk.
 4. Where an emergency construction or repair of an off-site improvement is necessary, to protect the health and safety of the City inhabitants, and such construction or repair is made by a public utility or public service company. However, a permit is required after the commencement of that work.

3002.6 PERMIT FEE SCHEDULE

- A. Refer to **APPENDIX D Fee Schedule** of the Engineering Design Criteria Manual.

3002.7 PENALTIES

- A. Any person convicted of violating the provisions of the City's *Standard Specifications and Construction Drawings* and/or *Engineering Design Criteria* or material referenced in them, or of failing to act or comply with the provisions of them shall be punished by a fine of not to exceed \$200 for each such violation or failure to comply.
- B. Each day that a violation or failure to comply exists shall constitute a separate

and distinct offense, and any one or more of such offenses may be set out in any complaint or information filed.

- C. Any person found in violation of the provisions of the City's *Standard Specifications and Construction Drawings* and/or *Engineering Design Criteria* will be denied issuance of any other City permits, approvals or inspections until the violation(s) are corrected or until written arrangements to correct the violation are submitted to, and accepted by, the City.

3003 STREET AND UTILITY INSPECTION CHECKLIST

3003.1 INTRODUCTION

This section is designed to provide the developer and his contractor with an overview of requirements for construction and inspection of subdivision utilities. Detailed information on utility design and construction is contained in the City's *Engineering Design Criteria*, *Standard Specifications and Construction Drawings*, and the City Code. Together these documents provide a basic outline for the construction of utilities in a subdivision. Should there be a perceived conflict between this document and the aforementioned documents, the user is requested to bring this conflict to the attention of the City Engineer. The Engineer will clarify these conflicts as quickly as possible. Any suggestions for additions to or improvements in this section will be accepted and acted on by the Engineer.

3003.2 ORGANIZATION

This section is organized around the basic utilities common to most subdivisions. Under the utility heading the section is further subdivided into the following topics:

- A. Submittals/Permits Required Prior to Construction
- B. Submittals Required During Construction
- C. Required Inspections
- D. Key Items Checked by Inspectors

3003.3 SITE PREPARATION

- A. **Submittals/Permits Required Prior to Construction:**
 - 1. Accepted Preliminary Plat
 - 2. Site Grading Plans
 - 3. Earth Change Permit
 - 4. Burning Permit (If Required, from Fire Department)
 - 5. Fill Material (If Required)
- B. **Submittals Required During Construction:**
 - 1. Documentation of proper disposal of any hazardous items removed from site.
 - 2. Compaction tests on any fill areas under future roads.

C. Required Inspections:

1. Pre-work inspection to locate potential future problems such as ponds, gullies to be filled in, drainage channels, and existing utilities.
2. Completion of site work.

D. Key Items Checked by Inspectors:

1. Are utilities flagged prior to starting excavation?
2. Is brush and refuse being disposed of properly?
3. Is cut and fill work in compliance with the accepted plan?
4. Are proper fill and compaction procedures being used?
5. Are measures being taken to prevent erosion?
6. Is excess fill being disposed of properly?

3003.4 STREETS**A. Submittals/Permits Required Prior to Construction:**

1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
2. Earth Change Permit
3. Concrete Mix Design
4. Asphalt Mix Design (If Required)
5. Testing Laboratory

B. Submittals Required During Construction:

1. Stabilization Reports on Subgrade
2. Compaction Reports on Subgrade
3. Compaction Reports on Base
4. Documentation of Concrete Mix
5. Documentation of Asphalt Mix (If Required)
6. Concrete test results
7. Asphalt test results (If Required)
8. Construction Staking

A. Required Inspections:

1. Subgrade prior to base work.
2. Street base prior to paving.
3. Form work for curb and gutters.

4. During start of paving operations.
5. Finished roadway to include core samples.
6. Final Inspection.

C. **Key Items Checked by Inspectors:**

1. Are all soil tests and compactions tests within prescribed limits?
2. When proof rolled with a loaded scraper or dump truck does the subgrade pump?
3. Has all unsuitable material been removed from the subgrade?
4. Has all vegetable matter been removed from the subgrade?
5. Have all utility lines been properly compacted?
6. Are all manholes, valves, and inlets at the proper elevation?
7. Do all water valve boxes have a 2' x 2' x 6" concrete pad (Asphalt Streets Only)?
8. Are curb forms a minimum of 6" high and 6" wide?
9. Is the street in the location and at the grade shown on the plans? And is the backside of the curb at least 12" deep?
10. Is the gutter at least 18" wide and the required thickness?
11. Are required wheelchair ramps formed into the curbs?
12. Does the concrete or asphalt delivered to the site conform to the accepted mix?
13. Is the concrete being placed at the thickness required on the plans?
14. Is the type of asphalt being placed at the thickness required on the plans?
15. Are expansion joints being placed at all intersections and radius points?
16. Are dowel bars and reinforcement placed as required by the plans?
17. Is the ground and air temperature within the limits for paving?
18. Is the asphalt above 225 degrees Fahrenheit and below 300 degrees Fahrenheit when placed?
19. Are proper placement procedures being followed?
20. Are there any areas on the finished street that do not properly drain?
21. Are saw joints placed at less than the maximum allowed for the paving thickness in the curb and gutter and the street?
22. Were all required cylinders pulled, checked by the accepted laboratory, and results of the tests given to the inspector?
23. Were required slump tests taken and results given to the inspector?

3003.5 STORM SEWERS

- A. Submittals/Permits Required Prior to Construction:

1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
 2. Earth Change Permit
 3. Submittal for Piping, Manholes, Manhole Covers, Curb Inlets and Grates.
 4. Concrete Mix Design
 5. Testing Laboratory
- B. Submittals Required During Construction:
1. Compaction Reports on Cuts in Street
 2. Documentation on Materials Used
 3. Construction Staking
- C. **Required Inspections:**
1. Materials Prior to Installation
 2. Location and Elevation
 3. Backfilling Procedures
 4. Manhole and Inlet Construction and Connections
 5. Forms and Rebar Prior to Concrete Placement
 6. Final Inspection
- D. **Key Items Checked by Inspectors:**
1. Do materials have any cracks or broken parts?
 2. Do materials comply with submittals?
 3. Are storm drains located properly and on grade?
 4. Is standard bedding material placed according to the Standard Drawings?
 5. Is the pipe backfilled with required material over top of pipe?
 6. Is standard bedding material used in streets and compacted to 95% density?
 7. Are manhole joints properly sealed?
 8. Are pipe joints properly sealed?
 9. Are pipes properly grouted at manholes and inlets?
 10. Are lift pin holes properly grouted?
 11. Is the manhole lid ring properly grouted inside and out?
 12. Are the curb inlets properly positioned and attached?
 13. Is reinforcing steel properly sized and placed?
 14. Are all grates and manhole lids in place?

15. Are all lines clean?
16. Do all lines flow properly?
17. Is there any ponding in the lines?

3003.6 IMPROVED DRAINAGE CHANNELS

- A. Submittals/Permits Required Prior to Construction:
 1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
 2. Earth Change Permit
 3. Concrete Mix (If Required)
 4. Vegetative Cover
 5. Erosion Control Plan
- B. Submittals Required During Construction:
 1. Concrete Mix Used
 2. Construction Staking
- C. Required Inspections:
 1. Form Work Prior to Concrete Placement
 2. Final Inspection
- D. Key Items Checked by Inspectors:
 1. Does the work comply with accepted plans?
 2. Does the ditch conform to planned slope?
 3. Are side slopes 3 to 1 or flatter?
 4. Was reinforcement placed as called for in the plans?
 5. Were side channels properly tied into the ditch?
 6. Was rip-rap placed at under street structures (if required)?
 7. Was the work area, that was not paved, properly seeded?
 8. Was erosion control placed as required?
 9. Does the ditch drain properly?
 10. Are there areas where water ponds?
 11. Were fill areas properly compacted?

3003.7 DETENTION FACILITIES

- A. Submittals/Permits Required Prior to Construction:
 - 1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
 - 2. Environmental Impact Statement (if required)
 - 3. Section 404 Permit from Corps of Engineers (if required)
 - 4. Concrete Mix
 - 5. Materials Used in Structure
 - 6. Vegetative Control
 - 7. Erosion Control
 - 8. Earth Change Permit
- B. Submittals Required During Construction:
 - 1. Compaction Reports
 - 2. Documentation on Materials Used
 - 3. Construction Staking
- C. Required Inspections:
 - 1. Location and Elevation of Facility
 - 2. Materials Prior to Installation
 - 3. Backfilling Procedures
 - 4. Forms and Reinforcement Prior to Concrete Placement
 - 5. Final Inspection
- D. Key Items Checked by Inspectors:
 - 1. Do materials have any cracks or broken parts?
 - 2. Do materials comply with submittals?
 - 3. Is the drainage structure located properly and on grade?
 - 4. Are proper backfilling and compaction procedures being used around the drainage structure?
 - 5. Are pipe joints properly sealed?
 - 6. Is reinforcing steel properly sized and placed?
 - 7. Does the drainage structure flow properly?
 - 8. Is the drainage structure clean, and is there any ponding inside the drainage structure?

9. Does the trickle channel flow properly?
10. Is the trickle channel properly located, and on the proper slope?
11. Does the work comply with accepted plans?
12. Was the work area, that was not paved, properly seeded?
13. Was erosion control placed as required?
14. Were fill areas properly compacted?

3003.8 GREENBELTS AND RESERVE AREAS

- A. Submittals/Permits Required Prior to Construction:
 1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
 2. Drainage Construction Permit.
- B. Submittals Required During Construction:
 1. Landscape plans.
 2. Landscape license agreement (If Required).
- C. Required Inspections:
 1. Preconstruction site inspection for tree size and condition and ground cover.
 2. Final Inspection
- D. **Key Items Checked by Inspectors:**
 1. Is there trash or cut brush in the greenbelt or reserve area?
 2. Is there vegetative cover over the ground surface of the greenbelt or reserve area?
 3. Are there any drainage problems inside the greenbelt or reserve area?
 4. Inspect for any specific improvements outlined on the plans for the subdivision.

3003.9 WATER LINES

- A. Submittals/Permits Required Prior to Construction:
 1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
 2. Submittals for Pipe, Valves, Fire Hydrants, Valve Boxes, and Fittings.
 3. Concrete Mix Design for Thrust Blocks
 4. Testing Laboratory
 5. Construction Permit from the City of Norman

6. Construction Permit for the State of Oklahoma

B. Submittals Required During Construction:

1. Documentation on Materials Used
2. Compaction Reports on Cuts in the Streets
3. Construction Staking

C. Required Inspections:

1. Materials Prior to Installation
2. Location and Elevation
3. Backfilling Procedures
4. Visual Inspection of All Valves, Fire Hydrants, Taps, and Bends Prior to Backfilling
5. Pressure and Testing and Sampling of the Completed Line: The steps below will be followed for pressure testing and sampling of a new water distribution line:
 - (a) City must flush the line of all dirt and air.
 - (b) The Contractor must add chlorine to sanitize the line.
 - (c) The City will bring the line up to a pressure of 150 PSI and the line must maintain that pressure for a period of 30 minutes with not more than a 5 PSI drop. If the line does not make the pressure test, then the contractor must repair the lines so that it will meet the test requirements. Following completion of the pressure test the Contractor should add additional chlorine if necessary to sanitize the line.
 - (d) City must flush the chlorine out of the line. Once the line is flushed the City will check the chlorine count to insure that it is in the range from 0 to 2.0 parts per million.
 - (e) The line will be allowed to set for a period of 48 hours without adding additional chlorine or flushing water through the system.
 - (f) The City will take water samples after the 48 hour period for two (2) consecutive days and turn in the samples for testing.
 - (g) If the samples from the line do not pass the City must flush the line and Contractor must add additional chlorine. Once this is done, the process of checking the line will start again at Paragraph 3001.9.C.5(d).
 - (h) If the samples in the line pass then the City will flush the line

completely and make sure that all valves area open.

D. Key Items Checked by Inspectors:

1. Does the pipe used in the project match the size and class in the submittals?
2. Do the fittings and fire hydrants match the materials accepted in the submittals?
3. Are the water lines being laid in the easement and at the required elevations?
4. Is standard bedding material or sand being placed according to Standard Drawing W 01?
5. Is a #12 copper wire being placed on the top of the PVC water pipe and connected to fire hydrants?
6. Are concrete thrust blocks being placed behind tees, fire hydrants, and bends (if required)?
7. Is ductile iron pipe, valves, and fittings being polywrapped properly?
8. Is the backfill in street areas being properly compacted and tested?
9. Are casings being placed under roads as required by the plans?
10. Are fire hydrants oil filled as required by City Specifications?
11. Are fire hydrants being placed at a height of 450 mm (18") minimum to 600 mm (24") maximum from ground level to the 113 mm (4½") steamer cap?
12. Can a meter wrench be placed on the valve, and is the valve box properly positioned?
13. Are all valves open?
14. Is a 2' x 2' x 6" concrete pad placed around all valve boxes?
15. Did the water line meet the pressure test requirements?
16. Were all sample points removed and backfilled?
17. Was the backfill of the water line in easement areas completed properly.

3003.10 SANITARY SEWERS

A. Submittals/Permits Required Prior to Construction:

1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
2. Submittals for Pipe, Manholes, Manhole Rings and Lids.
3. Concrete Mix

4. Construction Permit from City of Norman
5. Construction Permit from State of Oklahoma
- B. Submittals Required During Construction:
 1. Documentation on Materials Used
 2. Compaction Reports on Cuts in Streets
 3. Construction Staking
- C. Required Inspections:
 1. Material Prior to Installation
 2. Location and Elevation
 3. Backfilling Procedures
 4. Mandrel
 5. Pressure Test
 - (a) The Contractor must perform a pressure test on the line with the Inspector watching.
 - (b) The line must hold 4 PSI of air pressure for 7 minutes.
 - (c) Upon completion of the test the Contractor must remove all plugs from the line and replace the manhole covers.
 6. Manhole Grouting Before Backfill
 7. Taps Before Backfilling (If Required)
 8. Grouting of Pipe flow lines inside Manholes
 9. Final Inspection
- D. Key Items Checked by Inspectors:
 1. Does the pipe size and class match the submittals?
 2. Are pipes broken or cracked?
 3. Are the lines being laid at the proper elevation and in the easement?
 4. Is pipe bedding and backfill per SS 01?
 5. Is the line at least 3' below ground level?
 6. Is the backfill in street cuts being properly compacted and tested?
 7. In asphalt streets, is 4' x 4' x 8" concrete collar around manholes?
 8. Are service taps stubbed to the surface and located accurately on as-builts?

9. Is cast iron or a brass plug placed on the stub out and fence or pipe post marker in place?
10. Are manholes, rings, and lids as specified in submittals?
11. Are manhole joints properly sealed?
12. Are lift pin holes properly grouted?
13. Are manhole lid rings properly grouted inside and out?
14. Are pipes properly grouted at flowline inside manholes?
15. Do manhole bottoms provide for free flow?
16. Are all lines and manholes clean?
17. Do all lines flow properly without ponding?

3003.11 LIFT STATIONS

- A. Submittals/Permits Required Prior to Construction:
 1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
 2. Submittals for Pipe, Valves, and Fittings
 3. Submittals for Electrical Gear and Pumps
 4. Concrete Mix
 5. Submittals for Structural Materials
 6. Submittals for Force Main Pipe
 7. Construction Permit from City of Norman
 8. Construction Permit from State of Oklahoma
- B. Submittals Required During Construction:
 1. Documentation on Materials Used
 2. Compaction Report on Cuts in Streets
 3. Request for Telephone Line (If Required)
 4. Request to Turn On Power to Station
 5. Construction Staking
- C. Required Inspections:
 1. Materials Prior to Installation
 2. Location and Elevation of Station and Force Main

3. Grouting of All Station Penetrations Before Backfilling
4. Force Main Pressure Test (Line to be tested at 1.5 times the working pressure)
5. Tie into Gravity Sewer Before Backfilling
6. Final Inspection

D. Key Items Checked by Inspectors:

1. Does the pipe size and class match the submittals?
2. Are materials in good condition and free of defects?
3. Is the force main at the proper elevation and location?
4. Are proper backfill and compaction procedures used?
5. Is the force main clean and free of obstructions?
6. Is the station at the proper location and elevation?
7. Is the wet well properly sealed to prevent I & I?
8. Are electrical controls positioned for easy access?
9. Are all safety guards in place?
10. Are fittings and valves properly restrained?
11. Is the emergency dialer programmed and tied in?
12. Do the float Switches operate properly?
13. Does the station operate properly?
14. Does the force main flow freely?
15. Was a #12 copper wire taped to the top of the forcemain and connected to the manhole ring?

3003.12 SIDEWALKS AND GENERAL SITE CONDITIONS

A. Submittals/Permits Required Prior to Construction:

1. Accepted Plans for Grading, Streets, Drainage, Water, and Sewer.
2. Concrete Mix Design
3. Testing Laboratory
4. Earth Change Permit

B. Submittals Required During Construction:

1. Documentation of Concrete Mix

2. Concrete Test Results
 3. Construction Staking
 4. Erosion Control
- C. Required Inspections:
1. Forms and Reinforcement Prior to Placing Concrete
 2. Erosion Control During Project
 3. Construction Staking
 4. Erosion Control
- D. Key Items Checked by Inspectors:
1. Has unsuitable material been removed from sidewalk subgrade?
 2. Is the sidewalk at least 4" thick and 4' wide?
 3. Is reinforcement placed as called for in the plans?
 4. Does the concrete conform to the submittal?
 5. Are wheelchair ramps placed as required?
 6. Are expansion joints placed at less than 30'?
 7. Are sawed joints placed at 5' or less?
 8. Is the proper finish being placed on the sidewalk?
 9. Is the sidewalk in the proper location?
 10. Is erosion control being used properly?
 11. Is the site clean and trash free?
 12. Have all brush piles been removed and disposed of properly?
 13. Is construction debris properly disposed of?
 14. Does the site entrance have the required structure?

3003.13 WATER LINE TEST - ALLOWABLE LEAKAGE CHART

No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = .0000075 \text{ SDP}^{1/2}$$

Where:

L = Allowable leakage in gallons per hour

S = Length of pipe tested in feet.

D = Nominal diameter of pipe in inches.

P = Average test pressure during the leakage test, in pounds per square inch (gauge).

Allowable Leakage Per 1,000 Feet of Pipe in Gallons Per Hour

Nominal Pipe Diameter (Inches)											
P(PSI)	4	6	8	10	12	16	24	36	42	48	54
350				1.40	1.69	2.25	3.37	5.06	5.90	6.74	7.58
300				1.30	1.56	2.08	3.12	4.68	5.46	6.24	7.02
275				1.24	1.49	1.99	2.99	4.48	5.23	5.98	6.72
250				1.19	1.42	1.90	2.85	4.27	4.99	5.70	6.41
225				1.13	1.35	1.80	2.70	4.05	4.73	5.41	6.03
200				1.06	1.28	1.70	2.55	3.82	4.46	5.09	5.73
175	0.40	0.59	0.80	0.99	1.19	1.59	2.38	3.58	4.17	4.77	5.36
150	0.37	0.55	0.74	0.92	1.10	1.47	2.21	3.31	3.86	4.41	4.97
125	0.34	0.50	0.67	0.84	1.01	1.34	2.01	3.02	3.53	4.03	4.53
100	0.30	0.45	0.60	0.75	0.90	1.20	1.80	2.70	3.15	3.60	4.05
95	0.29	0.44	0.58	0.73	0.88	1.17	1.76				
90	0.02	0.03	0.04	0.05	0.06	0.08	0.13				
85	0.001	0.002	0.003	0.004	0.004	0.006	0.009				
80	0.0001	0.0002	0.0002	0.002	0.003	0.004	0.0006				
75	0.00001	0.00001	0.00001	0.00002	0.00002	0.00003	0.00004				

END OF SECTION 3000



Section 4000 Construction Drawings

February 2, 2023

City of Norman

STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS

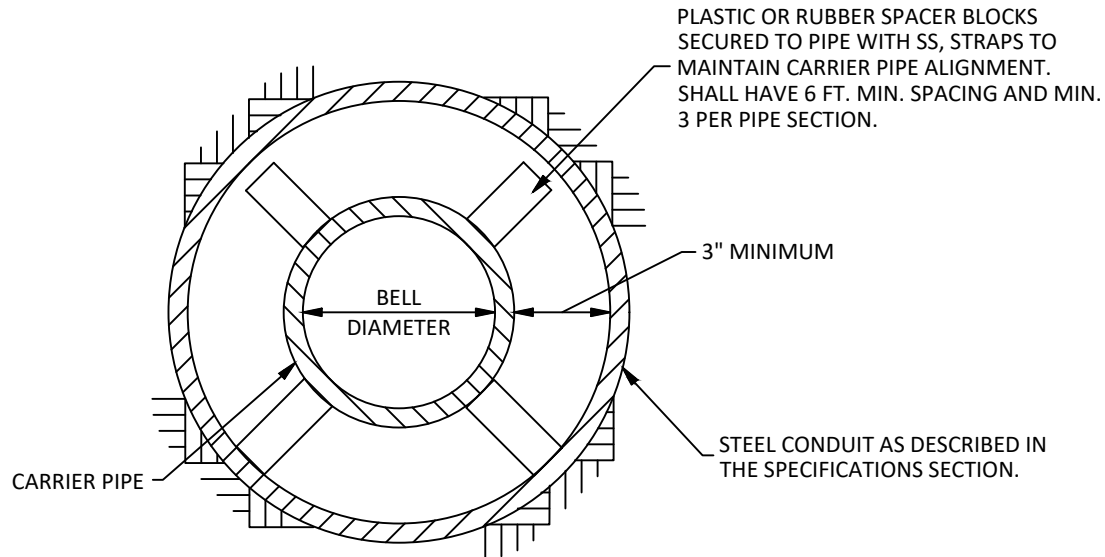
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PIPE & STEEL CONDUIT SCHEDULE	
CARRIER PIPE DIAMETER IN.	MIN. CONDUIT DIAMETER IN.
4	10
6	12
8	14
10	18
12	20
16	24
18	26
20	30
24	33
30	40
36	54
42	60

BORING AND CONDUIT

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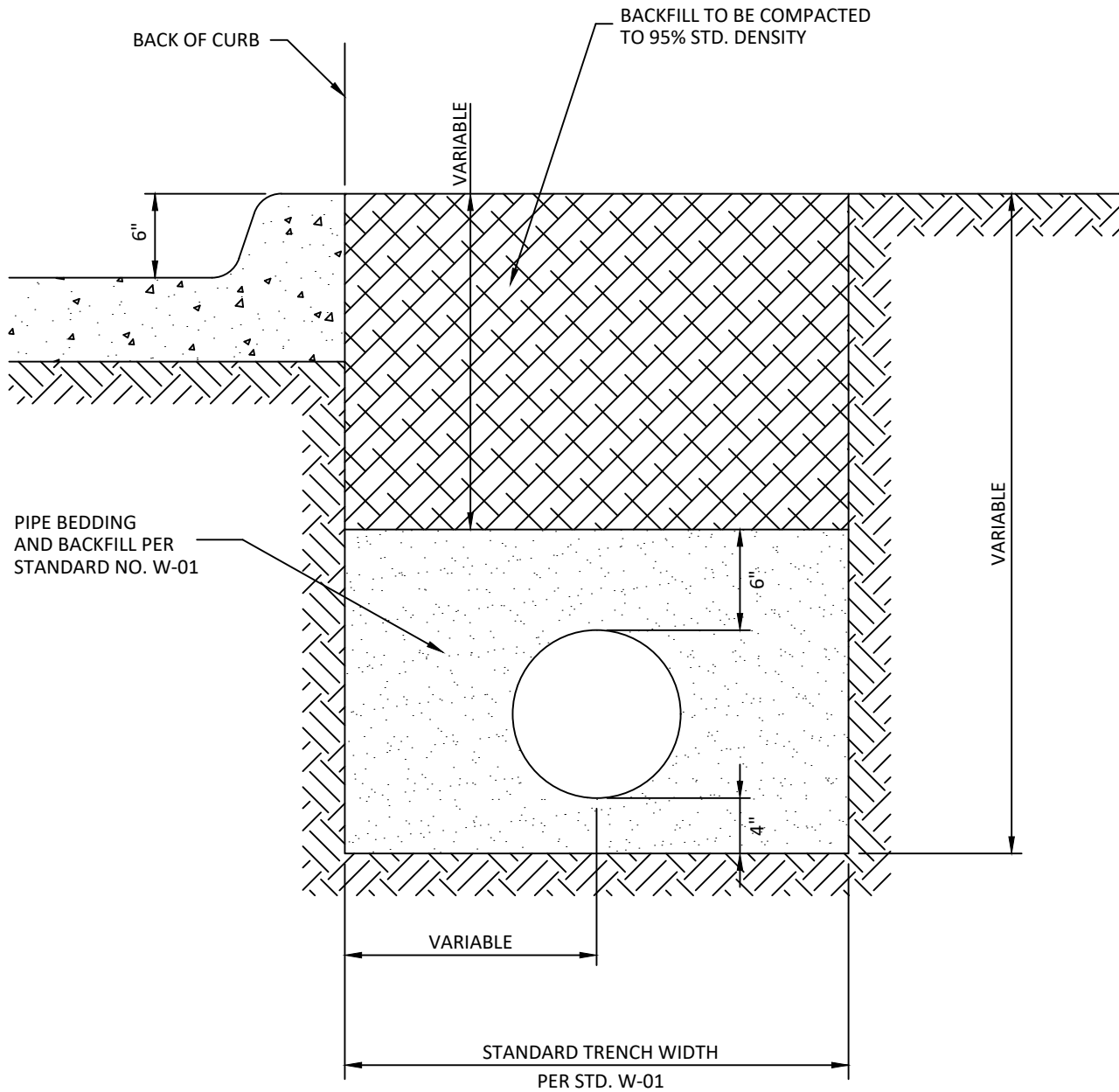
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TRENCH ADJACENT TO ROADWAY

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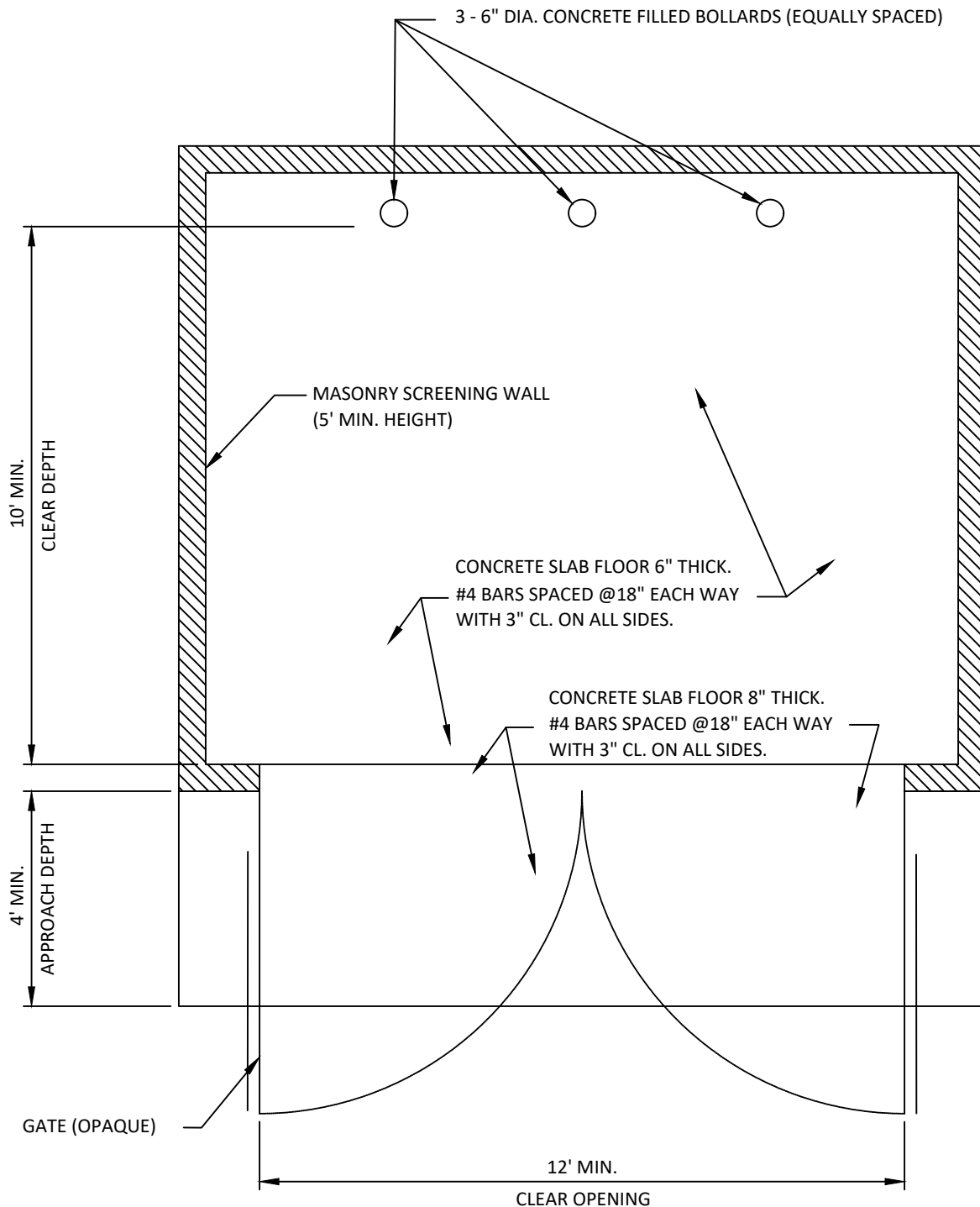
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**NOTES:**

1. FOUNDATION SHALL COMPLY WITH CURRENT CITY OF NORMAN BUILDING CODE DESIGN.
2. SCREENING MUST BE BUILT OF MASONRY.
3. HEIGHT OF SCREENING SHALL BE 1-FOOT ABOVE HEIGHT OF CONTAINER WITH A MINIMUM HEIGHT OF 5-FOOT.
4. GATES MUST BE OPAQUE AND HAVE A PERMANENT HOLD OPEN DEVICE.
5. AN UNOBSTRUCTED OVERHEAD CLEARANCE OF 22-FEET IS REQUIRED.
6. SEE STANDARD GC-04 FOR TURNING RADII OF SANITATION VEHICLES.

SOLID WASTE CONTAINER ENCLOSURE

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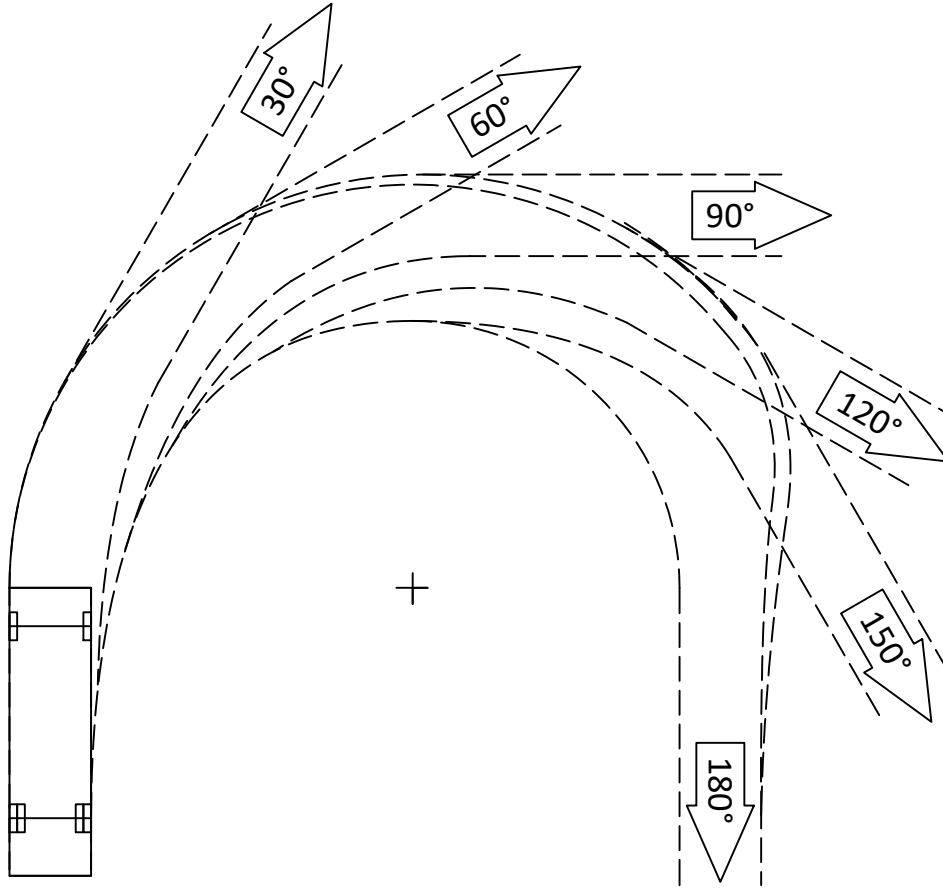
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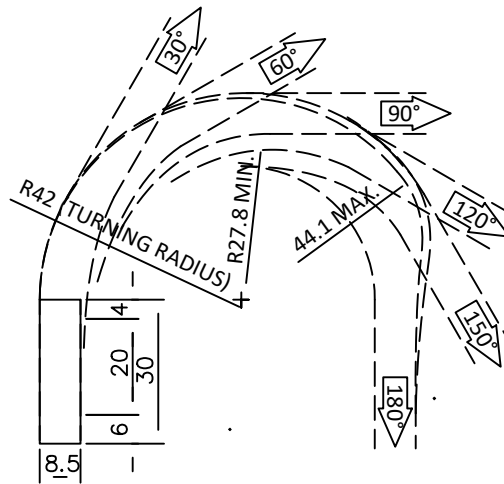
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SCALE: 1"=20'



SCALE: 1"=40'

FROM THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS; "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS"; 1990: SINGLE UNIT TRUCK DESIGN VEHICLE

SANITATION TRUCK TURNING RADIUS

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CITY OF NORMAN, OKLAHOMA

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W 04	RESTRAINED JOINTS	01/2023
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W 06	1" & 2" WATER AIR RELIEF VALVE & VAULT	01/2023
W 06A	WATER AIR RELIEF VALVE & VAULT	01/2023
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W 09B	FIRE HYDRANT ASSEMBLY (ALTERNATE)	01/2023
W 09C	SERVICE CONNECTIONS ON FIRE HYDRANT LATERALS	01/2023
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W 12	WATER LINE BLOW OFF VALVE ASSEMBLY	01/2023
W 13	WATER METER SERVICE CONNECTION INSTALLATION	01/2023
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W 20	FIRE LINE SINGLE CHECK VALVE MANHOLE	01/2023
W 21	PVC TO HDPE CONNECTION	01/2023

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CITY OF NORMAN, OKLAHOMA

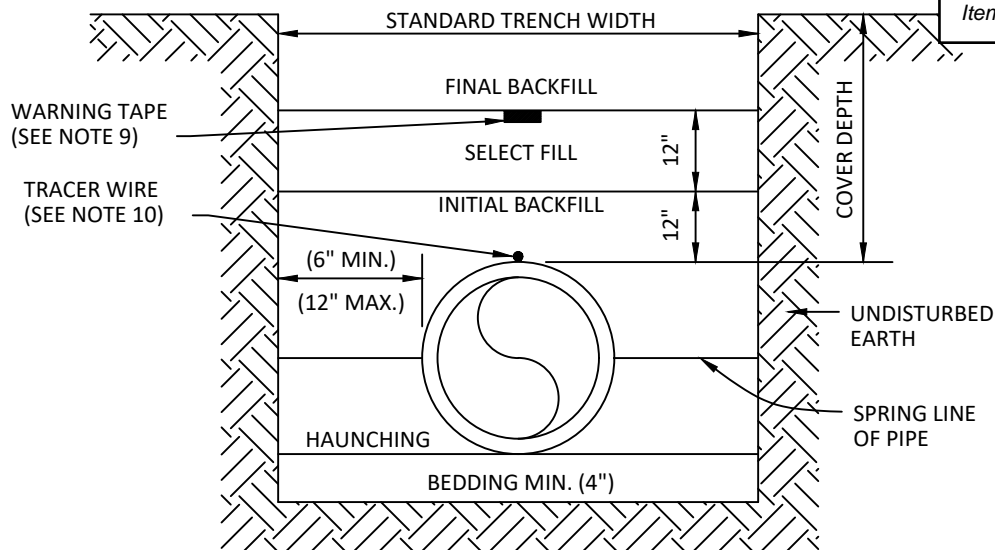
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NOMINAL PIPE INSIDE DIAMETER	STANDARD TRENCH WIDTH
IN.	IN.
6	18
8	24
10	30
12	30
15	36
18	36
21	42
24	42
27	48
30	48
36	54
42	60
48	66



TRENCHING MATERIALS				
BACKFILL DESCRIPTION	NON-PAVED AREAS		PAVED AREAS (SEE NOTE 8)	
	PVC	DUCTILE IRON	PVC	DUCTILE IRON
FINAL BACKFILL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	SBM	SBM
SELECT BACKFILL	SELECT FILL	SELECT FILL	SBM	SBM
INITIAL BACKFILL	SAND	SAND	SAND	SAND
HAUNCHING	SAND	SAND	SAND	SAND
BEDDING	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5

NOTES:

1. INSTALLATION AND BACK FILLING SHALL MEET MANUFACTURER'S RECOMMENDATIONS.
2. SELECT FILL CONSISTS OF EXCAVATED MATERIALS CONTAINING NO ROCKS LARGER THAN 2-INCHES.
3. STANDARD BACKFILL MATERIAL (SBM) SHALL CONFORM TO ODOT 703.01, TYPE A AGGREGATE BASE, RECYCLED CONCRETE, OR FLOWABLE FILL PER ODOT SECTION 701.19.
4. COMPACTION REQUIREMENTS:
 - A. NON-PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY FOR COHESIONLESS SOILS AND 85% FOR COHESIVE SOILS.
 - B. PAVED AREAS: 95% MAXIMUM STANDARD PROCTOR DENSITY FOR COHESIONLESS SOILS.
5. IF TRENCH IS DRY, BEDDING SHALL BE 4-INCH SAND ODOT 703.06, CLASS C. IF WET, MATERIAL SHALL BE 4-INCH NO. 57 OR 67 ROCK PER SECTION 701.06.
6. IN SANDY SOIL, CONTRACTOR MAY BACKFILL WITH NATIVE SANDY MATERIAL.
7. WITH APPROVAL FROM ENGINEER, WATER JETTING MAY BE ALLOWED IN OPEN TRENCHING, BUT NOT UNDER PROPOSED PAVEMENT.
8. THE BACKFILL MATERIAL SHALL EXTEND A MINIMUM OF 2-FEET BEHIND THE BACK OF CURB, OR THE EDGE OF PAVEMENT WHERE NO CURB EXISTS.
9. 3- OR 4-INCH WIDE BLUE METALLIC WARNING TAPE SHALL BE INSTALLED APPROXIMATELY 18- TO 24-INCHES ABOVE ALL WATERLINE PIPE.
10. TRACER WIRE SHALL BE #12 AWG SOLID COPPER WIRE WITH 30 MIL HDPE COATING. (SEE "H" IN SPECIAL PROVISIONS)
11. ONE (1) CLAY PIPE PLUG OR WATER DAM IS REQUIRED EVERY 400-FEET ALONG WATER LINE. CLAY DAM SHALL BE FULL WIDTH OF THE TRENCH, 5-FEET LONG, AND EXTEND A MINIMUM OF 24-INCHES ABOVE THE TOP OF THE WATER LINE.

WATER PIPE TRENCHING AND BEDDING

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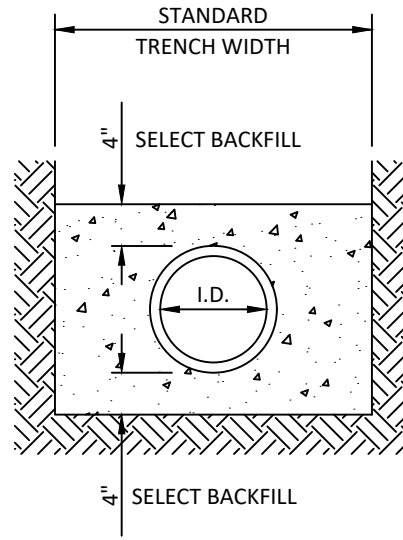
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DRAWING NO. W 01



CONCRETE ENCASEMENT

PIPE INSIDE DIAMETER IN.	STANDARD TRENCH WIDTH IN.	CONCRETE ENCASEMENT VOLUME CF/LF
6	18	1.55
8	24	2.32
10	30	3.20
12	30	3.38
15	36	4.52
18	36	4.73
21	42	6.05
24	42	6.19
27	48	7.69
30	48	7.76
36	54	9.43
42	60	11.21
48	66	13.10

CONCRETE ENCASEMENT

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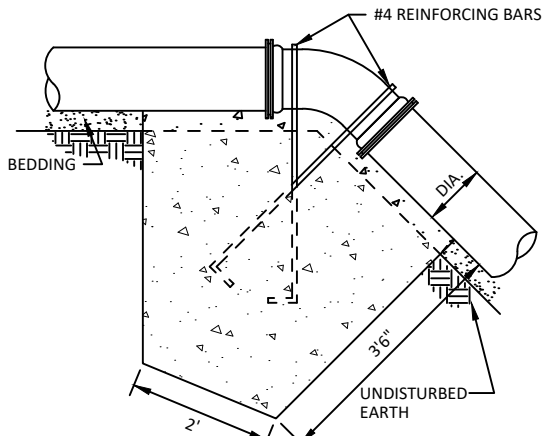
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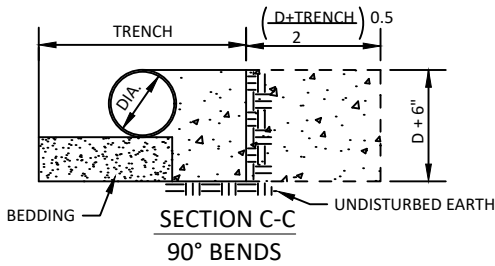
DRAWING NO. W 02

NOTE:

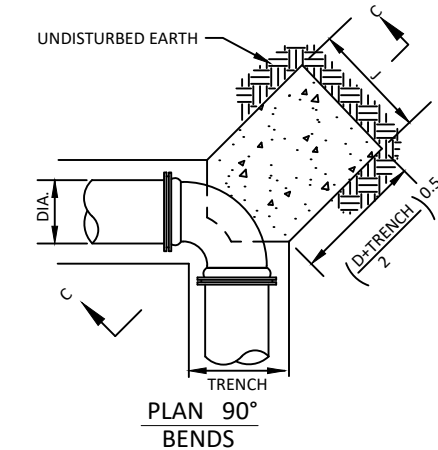
1. THRUST BLOCKS SHALL BE POURED SO THAT ALL FITTING BOLTS & NUTS REMAIN CLEAR AND ACCESSIBLE.
2. CONCRETE SHALL BE 3,500 PSI MIN.
3. THRUST BLOCKS ARE NOT REQUIRED ON T-FITTINGS FOR FIRE LINES.



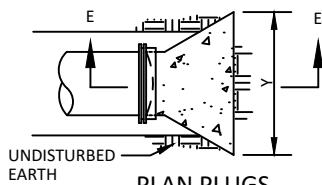
SECTION FOR
VERTICAL BENDS
45°, 22 1/2°, 11 1/4°
(14" OR SMALLER)



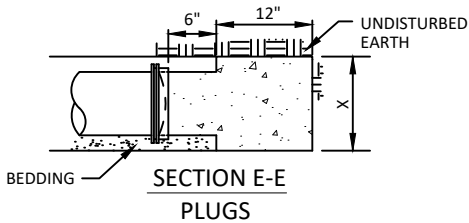
SECTION C-C
90° BENDS



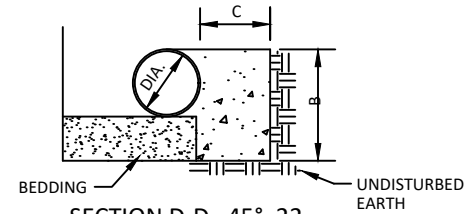
PLAN 90°
BENDS



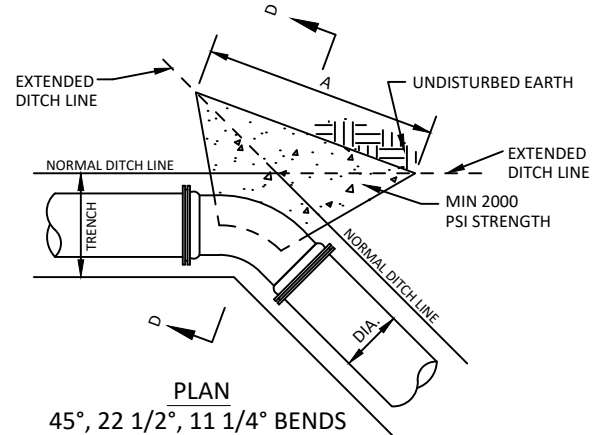
PLAN PLUGS



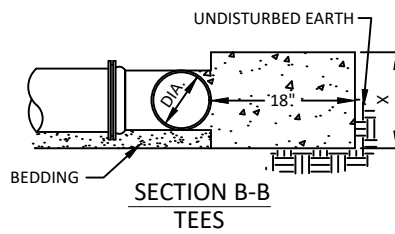
SECTION E-E
PLUGS



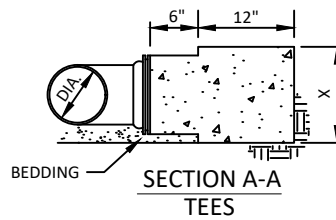
SECTION D-D 45°, 22
1/2°, 11 1/4° BENDS



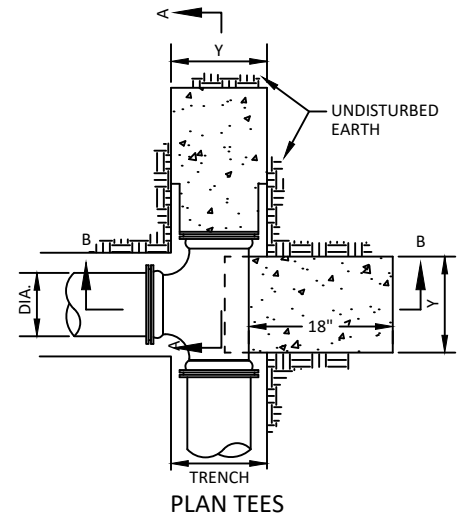
PLAN
45°, 22 1/2°, 11 1/4° BENDS



SECTION B-B
TEES



SECTION A-A
TEES



PLAN TEES

DIMENSIONS FOR CONCRETE THRUST BLOCKS													
PIPE	TRENCH	45° BEND			22 1/2° BEND			11 1/4° BEND			TEE OR PLUG		90° BEND
DIA.	WIDTH	A	B	C	A	B	C	A	B	C	X	Y	J
36	54	7'-0"	3'-0"	2'-6"	6'-0"	3'-0"	2'-6"	6'-0"	3'-0"	2'-6"	3'-4"	4'-0"	6'-5"
30	48	5'-6"	2'-6"	2'-0"	4'-6"	2'-6"	2'-0"	4'-6"	2'-6"	2'-0"	3'-0"	3'-6"	5'-8"
24	42	3'-9"	2'-6"	1'-10"	2'-6"	2'-6"	1'-1"	2'-0"	2'-6"	1'-0"	3'-0"	3'-3"	4'-9"
20	36	2'-9"	2'-2"	1'-8"	2'-0"	2'-2"	1'-1"	2'-0"	2'-2"	0'-11"	2'-0"	3'-0"	4'-1"
18	36	2'-3"	2'-0"	1'-6"	2'-0"	2'-0"	1'-1"	2'-0"	2'-0"	0'-11"	2'-0"	2'-3"	3'-9"
16	36	2'-0"	1'-10"	1'-5"	2'-0"	1'-10"	1'-1"	2'-0"	1'-10"	0'-11"	2'-0"	1'-6"	3'-6"
12	30	2'-0"	1'-6"	1'-4"	2'-0"	1'-6"	1'-0"	2'-0"	1'-6"	0'-11"	2'-0"	1'-0"	3'-0"
10	30	2'-0"	1'-4"	1'-4"	2'-0"	1'-4"	1'-0"	1'-10"	1'-4"	0'-11"	1'-8"	1'-0"	2'-8"
8	24	2'-0"	1'-2"	1'-4"	1'-10"	1'-2"	1'-0"	1'-8"	1'-2"	0'-11"	1'-6"	0'-10"	2'-4"
6	18	2'-0"	1'-1"	1'-4"	1'-8"	1'-1"	1'-0"	1'-6"	1'-0"	0'-11"	1'-4"	0'-8"	2'-1"

THRUST BLOCKS

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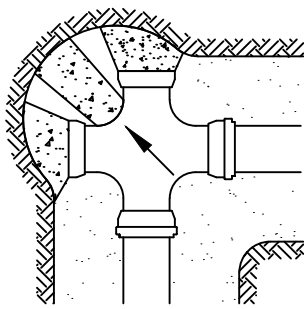
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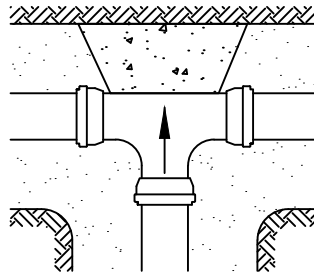
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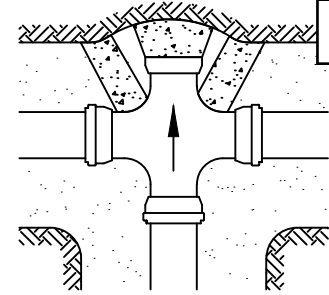
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HORZ. CROSS W/2 PLUGS

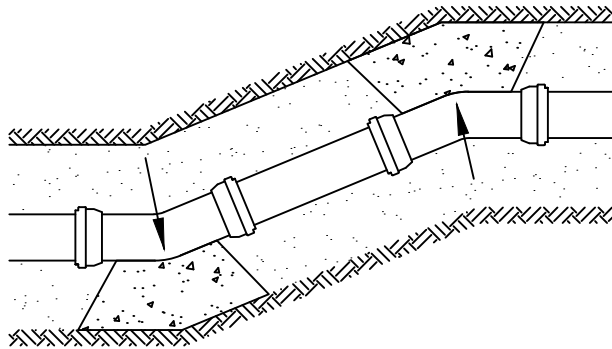


HORZ. TEE

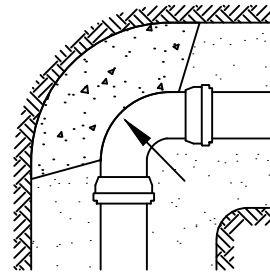


HORZ. CROSS W/1 PLUG

Item 6.



HORZ. 11.25, 22.50 & 45
DEGREE BENDS



HORZ. 90 DEGREE BENDS

HORIZONTAL AND DOWNWARD THRUST

THE FOLLOWING PROCEDURE SHALL BE USED TO ARRIVE AT THE AREA OF THRUST BLOCKING REQUIRED FOR DISTRIBUTION OF HORIZONTAL AND DOWNWARD THRUST TO UNDISTURBED SOIL:

- USE TEST PRESSURE OF 150 PSI OR AS DETERMINED BY THE ENGINEER.
- MULTIPLY PRESSURE OBTAINED FROM STEP A BY THE VALUE SHOWN IN TABLE 1 FOR THE APPROPRIATE FITTING AND PIPE SIZE. THIS IS THE TOTAL THRUST IN POUNDS AT THE FITTING.
- USE TABLE 2 TO DETERMINE THE BEARING STRENGTH OF THE SOIL AT THE SPECIFIC LOCATION.
- DIVIDE THE THRUST OBTAINED FROM STEP B BY THE BEARING STRENGTH OF THE SOIL OBTAINED FROM STEP C IN ORDER TO ARRIVE AT THE AREA REQUIRED FOR THRUST BLOCKING IN SQUARE FEET. THIS AREA IS THE MINIMUM SURFACE AREA THAT WILL BE IN CONTACT WITH UNDISTURBED SOIL.
- THRUST BLOCKS MAY BE USED IN LIEU OF MECHANICAL RESTRAINTS "MEGALUGS" FOR 4- TO 8-INCH WATERLINE CONSTRUCTION ONLY. IF MECHANICAL RESTRAINTS "MEGALUGS" ARE USED, THRUST BLOCKS ARE NOT REQUIRED FOR 4- TO 8-INCH MAINS. FOR 12-INCH AND LARGER MAINS, THRUST BLOCKS ARE REQUIRED ALONG WITH "MEGALUGS".
- CONTRACTOR HAS THE OPTION OF PLACING THRUST BLOCKING ALONG WITH MECHANICAL RESTRAINTS "MEGALUGS", IF SO DESIRED.
- SEE STANDARD DRAWING W04 FOR MECHANICAL "BELL RESTRAINT" JOINT REQUIREMENTS.

TABLE 1 THRUST PER 1 PSI OF WATER PRESSURE AT VARIOUS FITTINGS (LBS)					
PIPE SIZE (IN.)	DEAD END, TEE OR FH	90° ELBOW	45° ELBOW	22 1/2° ELBOW	
4	19	27	15	7	
6	39	55	30	15	
8	67	94	51	26	
10	109	154	84	43	
12	155	218	119	61	
14	210	296	161	82	
16	272	383	209	106	
18	351	494	269	137	
20	434	611	333	169	
24	623	878	478	244	

TABLE 2 BEARING STRENGTH OF SOILS	
SOILS AND SAFE BEARING LOADS	LBS. PER SQ. FT.
SOUND SHALE	10,000
CEMENTED GRAVEL AND SAND (DIFFICULT TO PICK)	4,000
COARSE AND FINE COMPACTED SAND	3,000
MEDIUM CLAY (CAN BE SPADED)	2,000
SOFT CLAY	1,000
MUCK	0

MINIMUM THRUST BLOCK REQUIREMENT
(MINIMUM SURFACE AREA IN CONTACT WITH UNDISTURBED SOIL AT
THE LOCATION INDICATED.)

NOTE:

- FITTINGS WHERE THRUST BLOCKS ARE REQUIRED SHALL BE WRAPPED WITH POLY WRAP PRIOR TO PLACING CONCRETE. THRUST BLOCKS SHALL BE FORMED & POURED SO THAT TEE, BOLTS, AND NUTS REMAIN ACCESSIBLE. CONCRETE SHALL BE 3,500 PSI (MIN.).

THRUST BLOCKS CONT.

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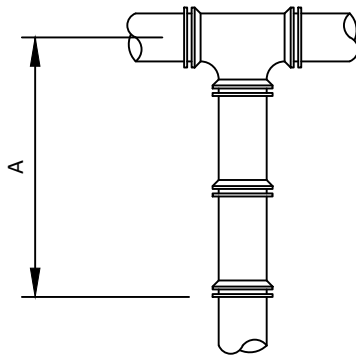
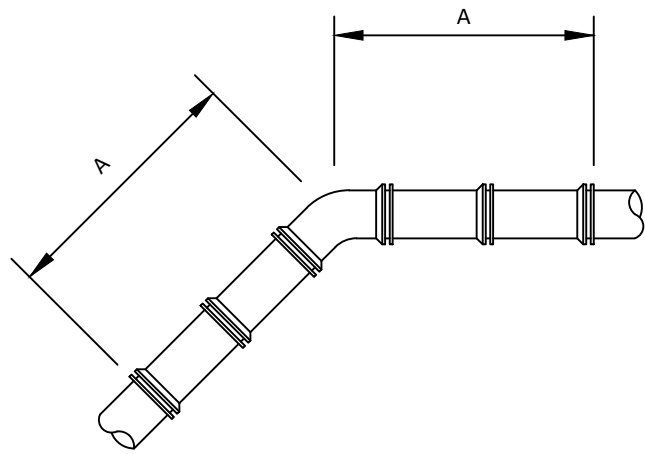
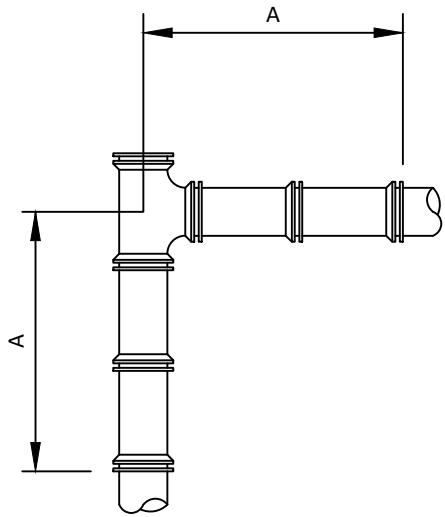
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DRAWING NO. W 03A

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**NOTES:**

1. THE LENGTHS OF PVC DR18 PIPE WITH RESTRAINED JOINTS ARE BASED ON A COMPACTED SAND SURROUNDING THE PIPE WITH 3'-6" OF COVER.
2. ALL PIPE 12-INCHES AND LARGER SHALL HAVE MECHANICAL JOINT RESTRAINTS INSTALLED WITH ALL FITTINGS EXCEPT FOR "IN-LINE" FITTINGS SUCH AS SOLID SLEEVES. THE CONTRACTOR HAS THE OPTION ON 6- AND 8-INCH WATER LINE CONSTRUCTION TO USE THRUST BLOCKS PER STANDARD DRAWING W-03 IN-LIEU OF MECHANICAL JOINT RESTRAINTS.
3. MECHANICAL BELL/JOINT RESTRAINTS SUCH AS EBAA 1900 SPLIT SERRATED RESTRAINT HARNESS OR STAR PVC STARGRIP SERIES 4400 OR APPROVED EQUAL.
4. DIP THRUST RESTRAINT DESIGN MUST BE APPROVED BY THE UTILITIES ENGINEER.

RUN		RESTRAINT LENGTH "A"			
SIZE	TEE & PLUG	90° BEND	45° BEND	22-1/2" BEND	11-1/4" BEND
IN.	FT.	FT.	FT.	FT.	FT.
6	12	17	10	6	3
8	16	22	13	8	4
10	19	27	16	9	5
12	23	32	19	11	6
14	26	36	21	12	7
16	29	41	24	14	8
18	32	45	26	15	8
20	35	50	29	16	9
24	41	58	34	19	10
30	50	70	40	22	12
36	58	82	46	26	14
42	66	93	52	29	15

(LENGTH REQUIRED FOR RESTRAINING JOINTS)

RESTRAINED JOINTS

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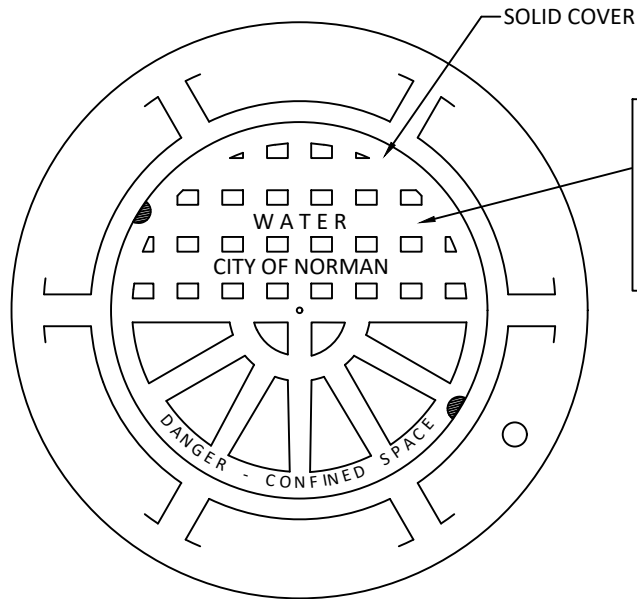
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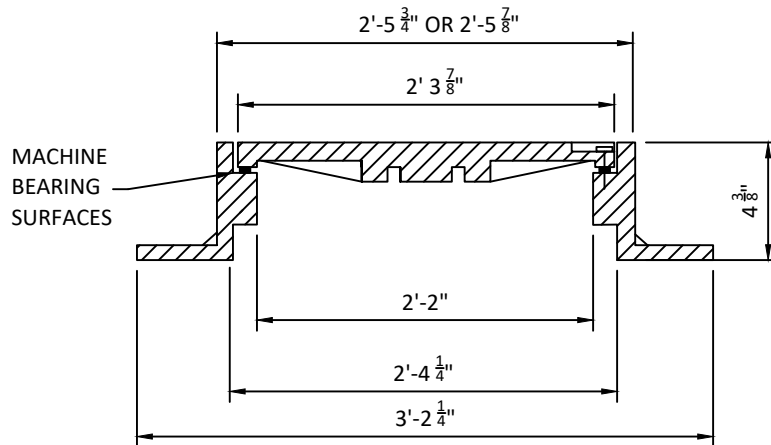
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REV. NO. 01

DRAWING NO. W 04



PLAN



SECTION

NOTE:

1. ACCEPTABLE UNITS:
 - A. NEENAH NO. R-1682
 - B. EJI NO. 210 OR APPROVED EQUAL
2. REVIEWING AUTHORITY MAY REQUIRE LARGER OPENING OR RECTANGULAR HATCH AS NEEDED TO ACCESS INTERNAL COMPONENTS.

WATER VAULT FRAME AND COVER

CITY ENGINEER APPROVAL:

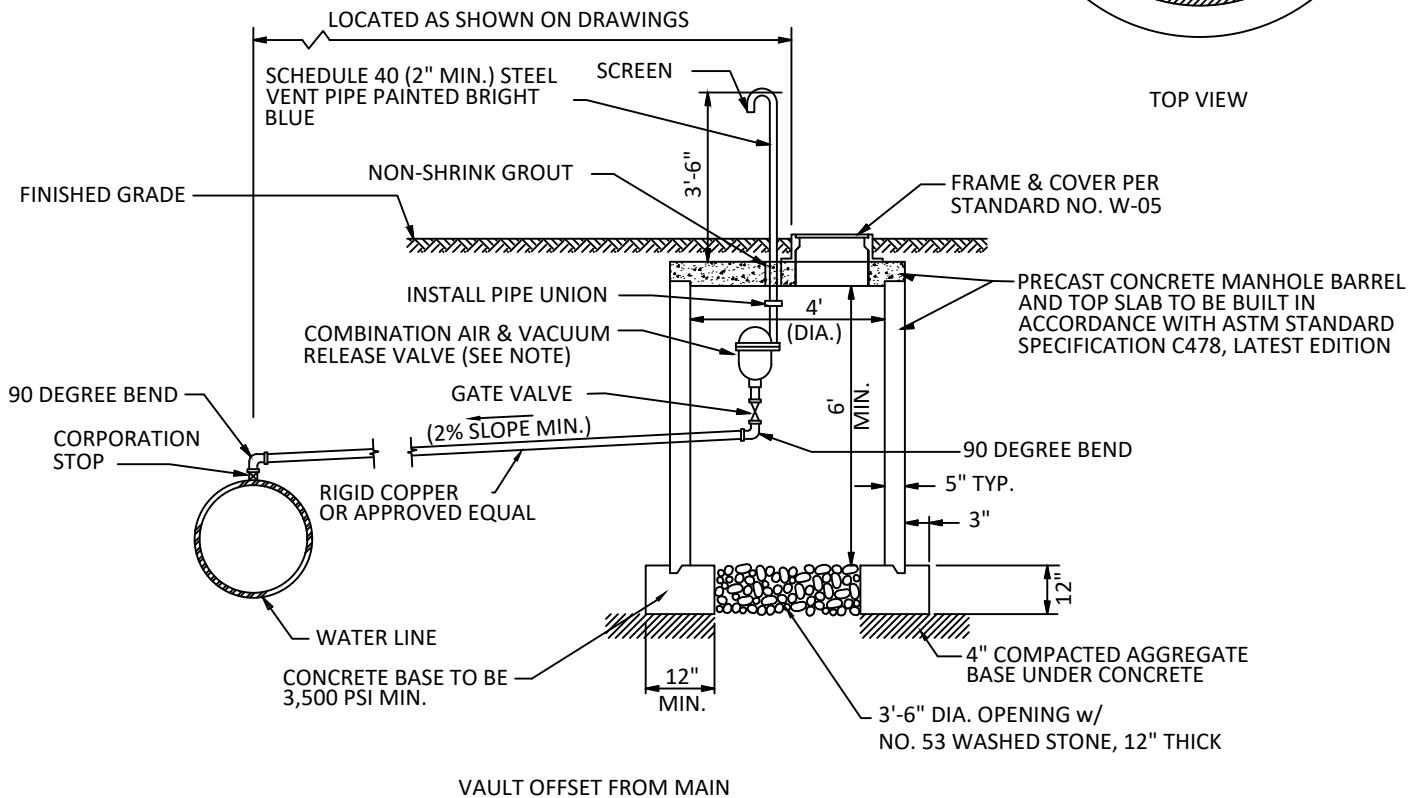
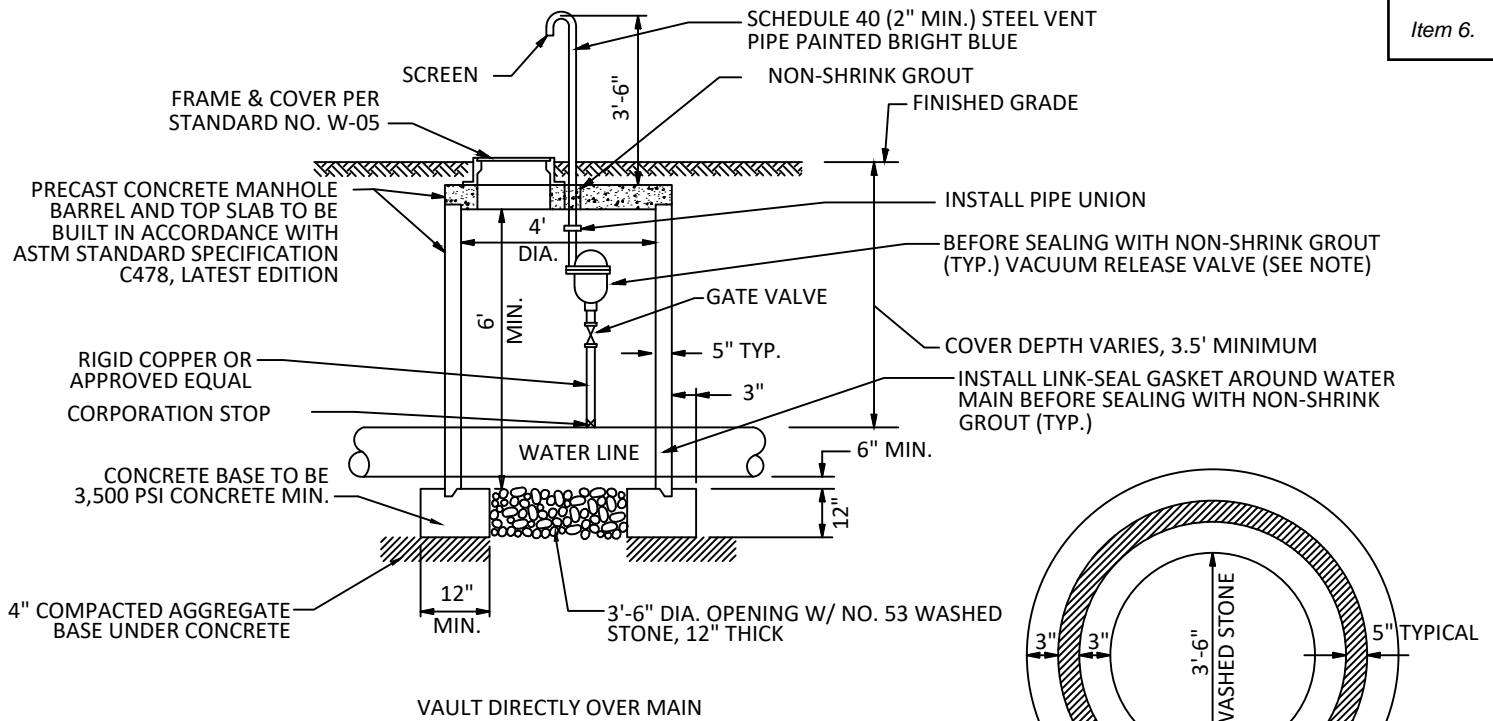
CITY OF NORMAN, OKLAHOMA

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REV. NO. 02

DRAWING NO. W 05



NOTES:

1. COMBINATION ARV SHALL BE VAL-MATIC MODEL 101S, 102S, 103S; CLA-VAL 36 SERIES; OR APPROVED EQUAL. SIZE SHALL BE PER ENGINEER

1" & 2" WATER AIR RELIEF VALVE & VAULT

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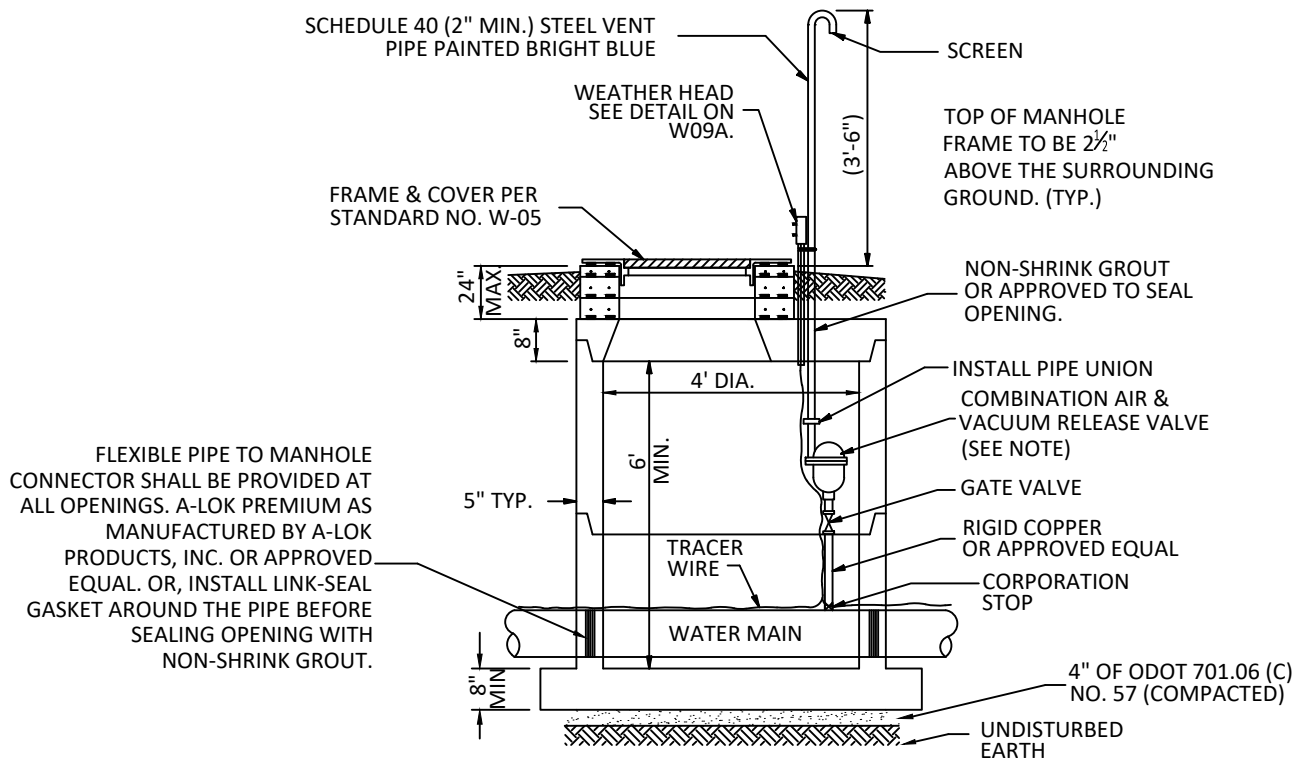
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

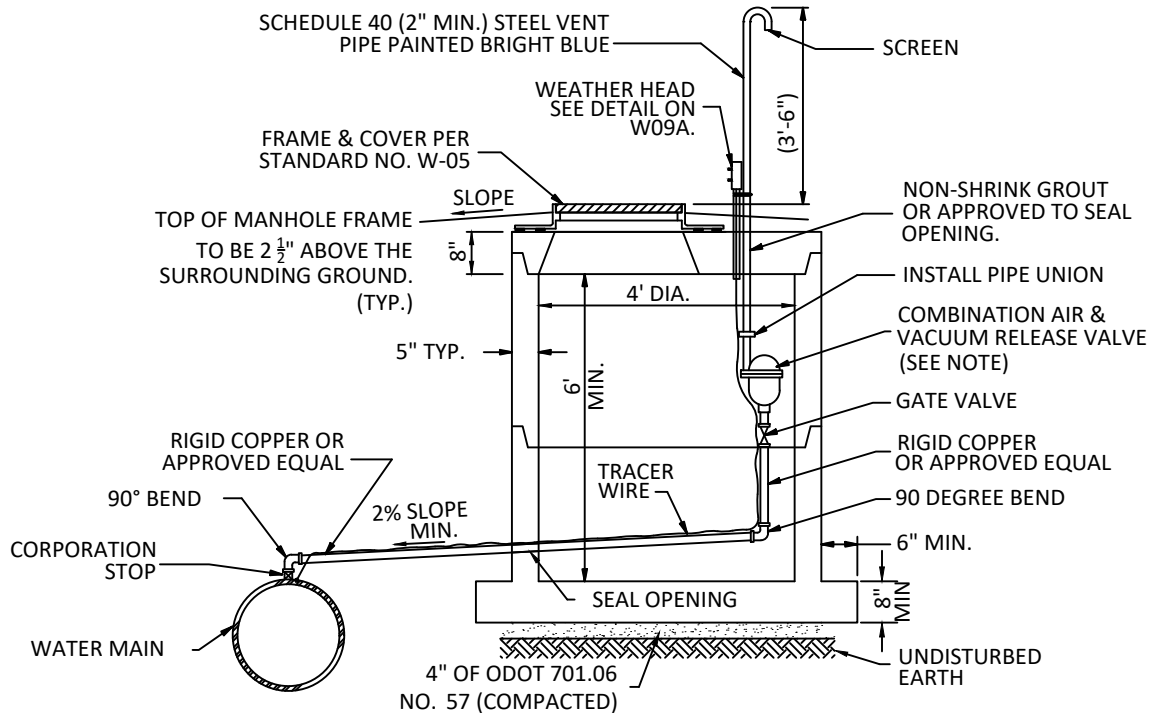
REVISION DATE: 01/2023

REV. NO. 02

DRAWING NO. W 06



VAULT DIRECTLY OVER MAIN



VAULT OFFSET FROM MAIN

NOTES:

1. COMBINATION ARV SHALL BE VAL-MATIC MODEL 101S, 102S, 103S; CLA-VAL 36 SERIES; OR APPROVED EQUAL. SIZE SHALL BE PER ENGINEER.
2. PRECAST CONCRETE MANHOLE BOTTOM BARREL SECTION & FLAT TOP TO BE BUILT IN ACCORDANCE WITH ASTM STANDARD SPECIFICATION C478, LATEST EDITION
3. MANHOLE FRAME TO BE SECURED AND SEALED TO MANHOLE WITH MASTIC SEALANT (RAM-NECK).
4. MANHOLE FRAME CAN BE INVERTED INSIDE MANHOLE IF POSSIBLE.
5. 2- OR 4-INCH REINFORCED CONCRETE ADJUSTMENT RINGS MAY BE USED AS NEEDED. RINGS SHALL BE SECURED & SEALED TO MANHOLE WITH MASTIC SEALANT (RAM-NECK).

WATER AIR RELIEF VALVE & VAULT

CITY ENGINEER APPROVAL:

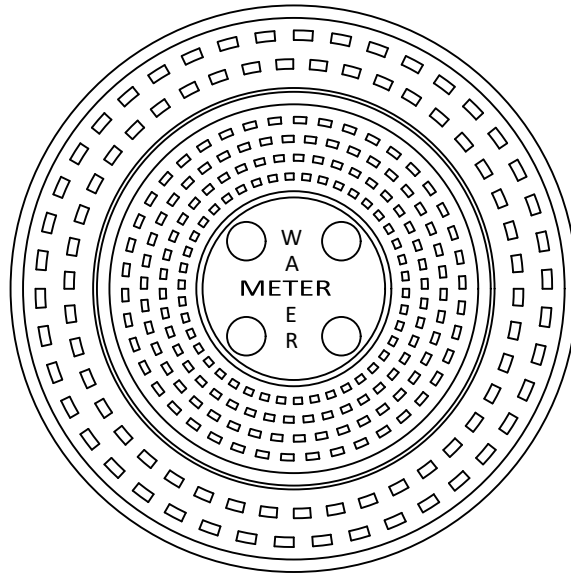
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

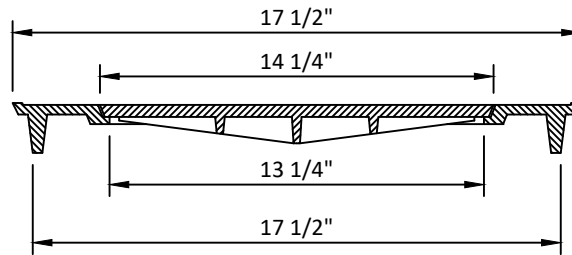
REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 06A



TOP VIEW
(SMALL METER ONLY)



SECTION VIEW
(SMALL METER ONLY)

	WEIGHT
LID	(19 LBS)
RING	(12 LBS)
SET	(31 LBS)

(SMALL METER ONLY)

NOTE:

1. SMALL METER BOX (3/4" METER): COVER TO BE "OLD CASTLE" CARSON MODEL 2200 CAST IRON WITH LOCKING DEVICE OR EQUAL. CAST IRON COVER SHALL INDICATE WATER METER IN THE CASTING.
2. MEDIUM METER BOX (1 1/2" METER): COVER TO BE "OLD CASTLE" CARSON MODEL 1324 HDPE FLUSH MOUNT WITH CAST IRON READER DOOR AND LOCKING DEVICE OR EQUAL.
3. LARGE METER BOX (2" METER): COVER TO BE "OLD CASTLE" CARSON MODEL 1730 HDPE FLUSH MOUNT WITH CAST IRON READER DOOR AND LOCKING DEVICE OR EQUAL.

WATER METER FRAME & LID

CITY ENGINEER APPROVAL:

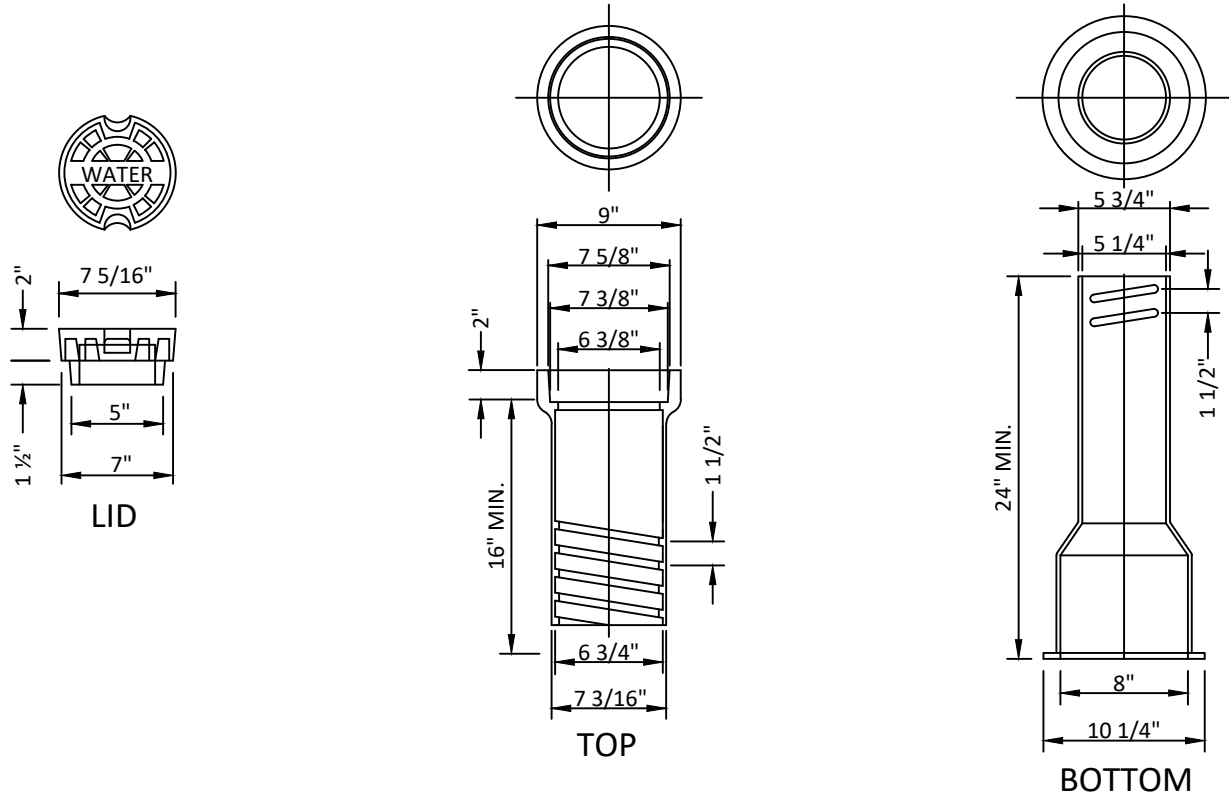
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: **01/2023**

REV. NO. **01**

DRAWING NO. **W 07**

**NOTES:**

1. CONTRACTOR TO PLACE TYPE A OR TYPE B CONCRETE GRADE RING AROUND EACH WATER LINE VALVE BOX AFTER FINAL GRADING HAS BEEN COMPLETED AND TRENCHES HAVE SETTLED. (SEE DETAIL W-09e)
2. VALVE BOXES REQUIRING ADDITIONAL HEIGHT SHALL BE EXTENDED USING 6-INCH PVC DR18 PIPE WITH A BOTTOM AND TOP SECTION PLACED ON TOP OF THE PVC PIPE. PIPE SHOULD BE CUT TO FIT VALVE.
3. CONTRACTOR SHALL ADJUST CONCRETE GRADE RINGS AS NECESSARY IF GROUND SETTLES LATER.

VALVE BOX

CITY ENGINEER APPROVAL:

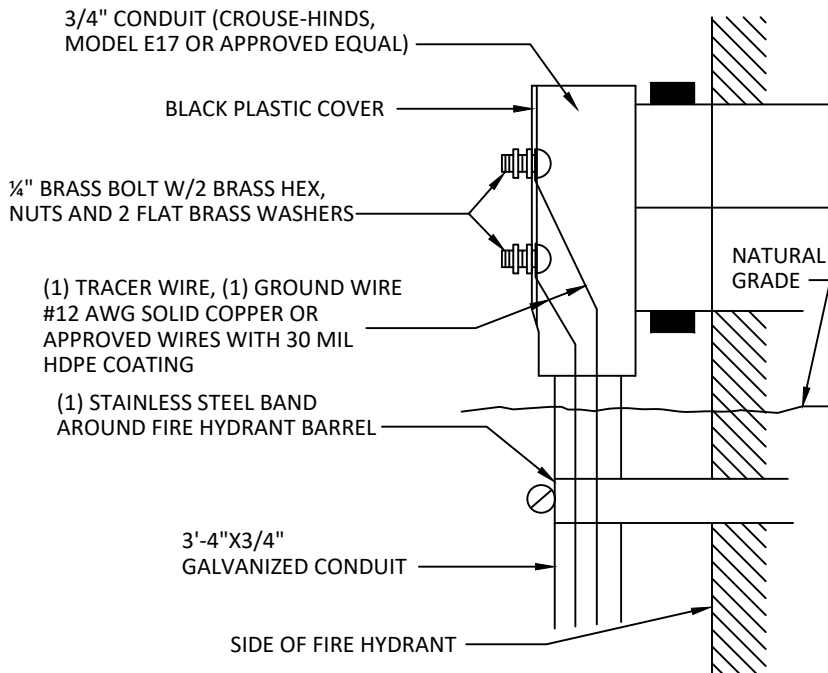
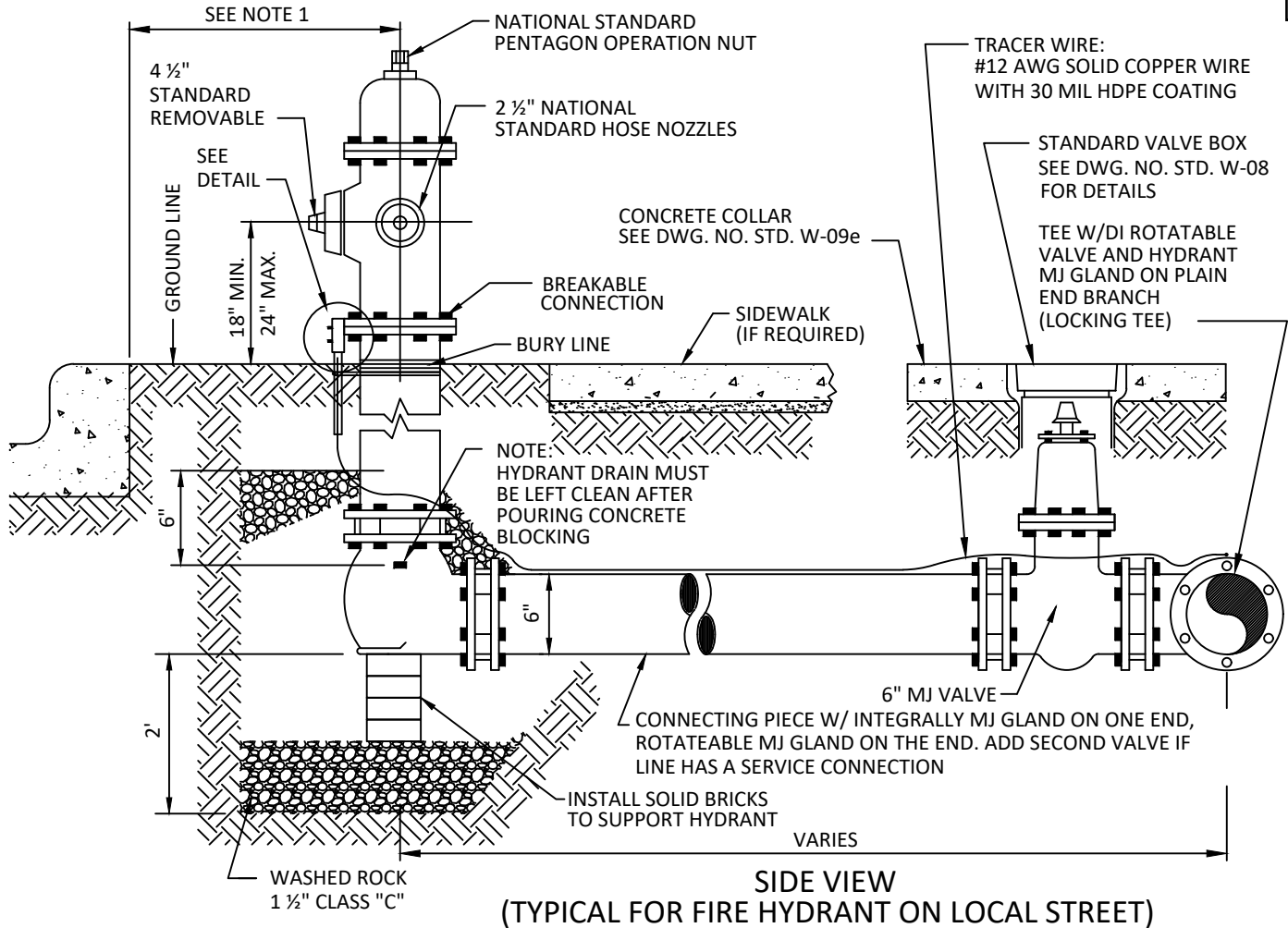
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 08

**NOTES:**

1. INSTALLATION DEPTH SHOULD BE 3-FEET MIN. AND 6-FEET MAX.
2. THRUST BLOCKING IS REQUIRED BEHIND BOTH THE TEE & THE FIRE HYDRANT IF RESTRAINED JOINTS ARE NOT USED. THRUST BLOCKING IS NOT REQUIRED IF RESTRAINED JOINTS ARE UTILIZED ON THE FIRE HYDRANT ASSEMBLY.
3. WRAP TEE AND FIRE HYDRANT WITH POLY WRAP IF THRUST BLOCKS WILL BE POURED.
4. ALL FITTINGS SHALL BE EPOXY COATED AND CONNECTED USING STAINLESS STEEL BOLTS AND NUTS.
5. IF LOCKING TEE IS NOT USED THEN TEE, VALVE, & FH ASSEMBLY MUST BE TIED TOGETHER WITH SS ALL-THREAD THRUST BLOCKING BEHIND TEE & FIRE HYDRANT MAY BE USED INSTEAD OF ALL-THREAD.
6. CONNECTING PIECE BETWEEN VALVE, FH, & TEE MAY BE PVC DR18 PIPE WITH RESTRAINTS IF NEEDED.
7. TEE'S LARGER THAN 12-INCHES WILL BE PAID SEPARATELY.

FH ASSEMBLY INCLUDES

- 1.) (1)-3-WAY FIRE HYDRANT
- 2.) (1)-6" CONNECTING PIECE
- 3.) (1)-6" MJ GATE VALVE
- 4.) (1)-LOCKING TEE (6" THRU 12" LINE)
- 5.) (1)-CONCRETE COLLAR/THRUST BLOCKS
- 6.) (1)-ADJUSTABLE VALVE BOX W/LID & COLLAR
- 7.) (1)-WEATHERHEAD ASSEMBLY
- 8.) SS ALL-THREAD AND RESTRAINTS AS NEEDED

FIRE HYDRANT ASSEMBLY

CITY ENGINEER APPROVAL:

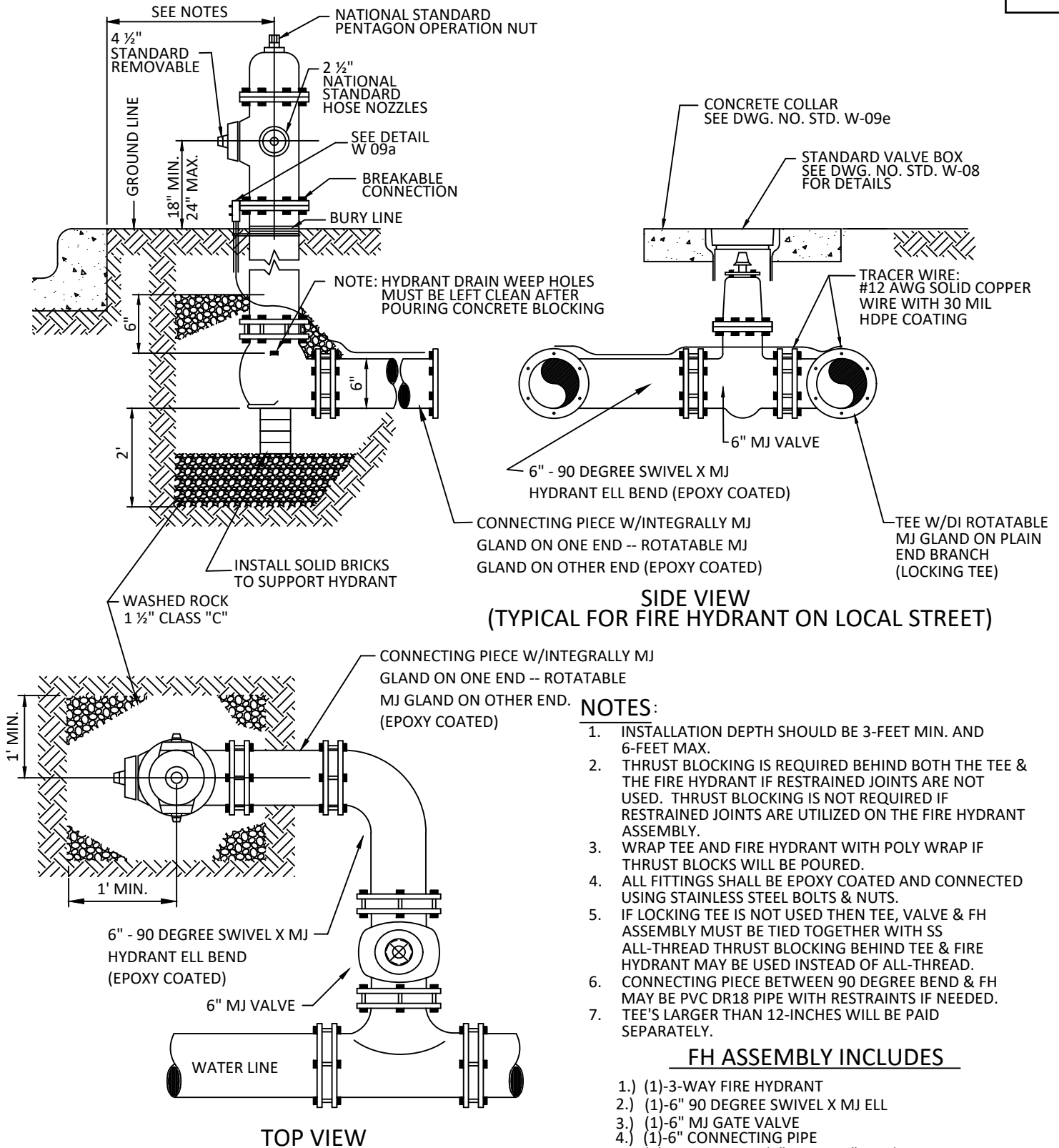
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 04

DRAWING NO. W 09A



FIRE HYDRANT ASSEMBLY (ALTERNATE)

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

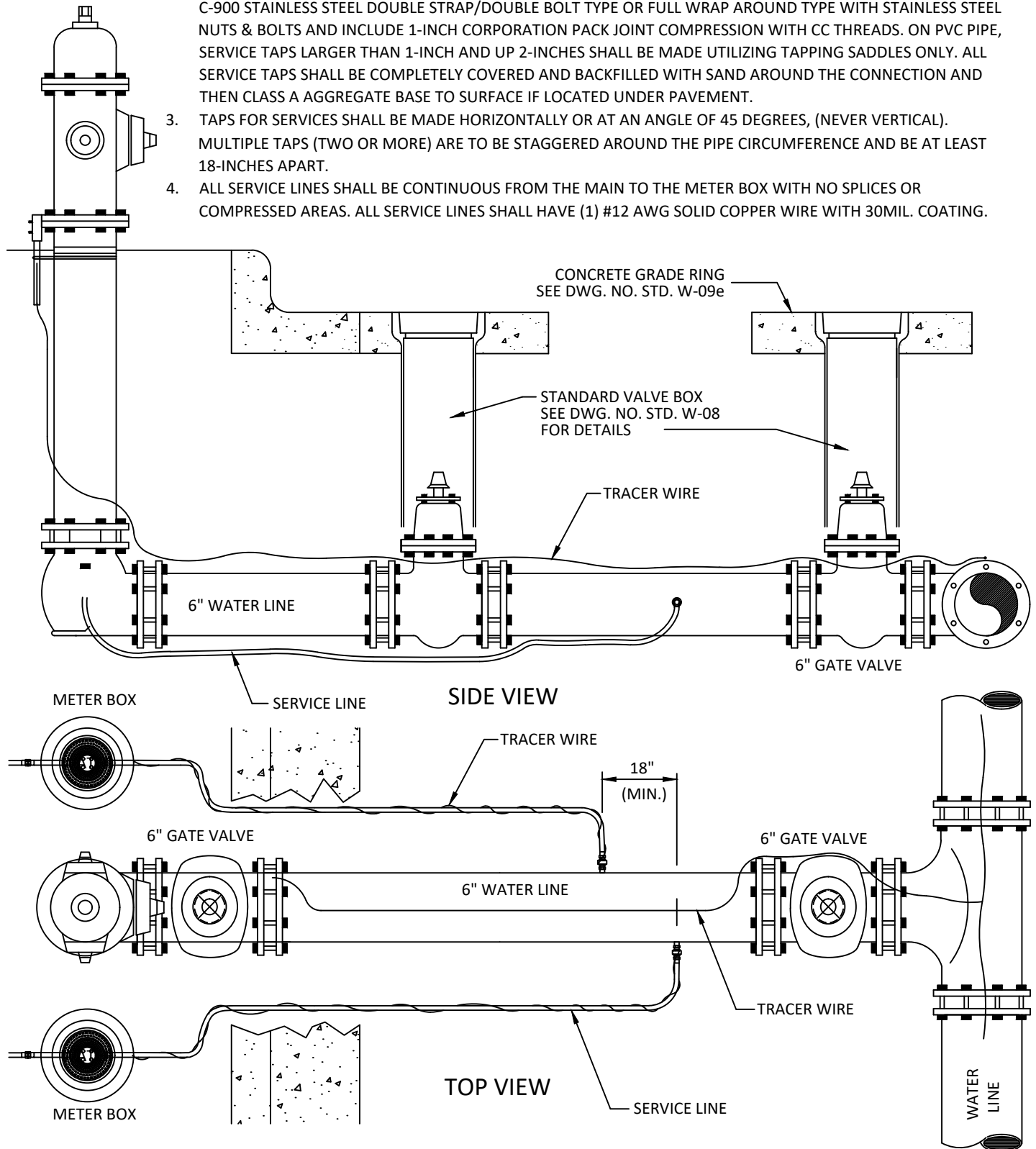
REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 09B

NOTES:

1. SERVICE LINES SHALL BE HDPE (BLUE) 1-INCH CTS (COPPER TUBE SIZE) AND CONFORMING TO ASTM D2737, PE-3408, SDR9-(200 PSI) RATED AND AWWA C-901 SHALL BE UTILIZED.
2. ALL 1-INCH SERVICE TAPS SHALL BE MADE WITH A TAPPING SADDLE ON PVC PIPE WITH A WALL THICKNESS OF AT LEAST DR18. THREADED CONNECTIONS SHALL UTILIZE TEFLON TAPE. IF SADDLES ARE USED, SADDLES SHALL BE C-900 STAINLESS STEEL DOUBLE STRAP/DOUBLE BOLT TYPE OR FULL WRAP AROUND TYPE WITH STAINLESS STEEL NUTS & BOLTS AND INCLUDE 1-INCH CORPORATION PACK JOINT COMPRESSION WITH CC THREADS. ON PVC PIPE, SERVICE TAPS LARGER THAN 1-INCH AND UP 2-INCHES SHALL BE MADE UTILIZING TAPPING SADDLES ONLY. ALL SERVICE TAPS SHALL BE COMPLETELY COVERED AND BACKFILLED WITH SAND AROUND THE CONNECTION AND THEN CLASS A AGGREGATE BASE TO SURFACE IF LOCATED UNDER PAVEMENT.
3. TAPS FOR SERVICES SHALL BE MADE HORIZONTALLY OR AT AN ANGLE OF 45 DEGREES, (NEVER VERTICAL). MULTIPLE TAPS (TWO OR MORE) ARE TO BE STAGGERED AROUND THE PIPE CIRCUMFERENCE AND BE AT LEAST 18-INCHES APART.
4. ALL SERVICE LINES SHALL BE CONTINUOUS FROM THE MAIN TO THE METER BOX WITH NO SPLICES OR COMPRESSED AREAS. ALL SERVICE LINES SHALL HAVE (1) #12 AWG SOLID COPPER WIRE WITH 30MIL. COATING.



SERVICE CONNECTIONS ON FIRE HYDRANT LATERALS

CITY ENGINEER APPROVAL:

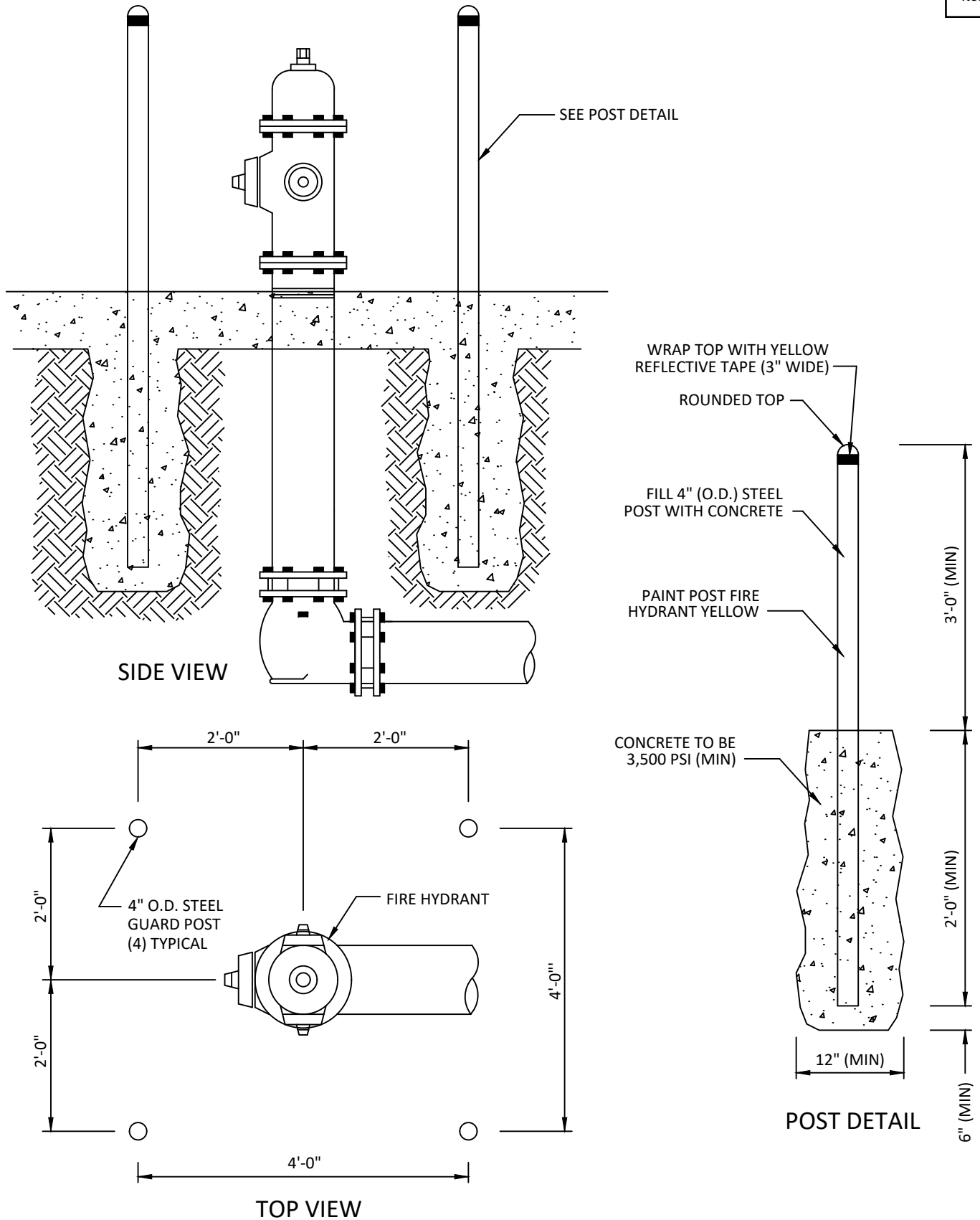
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 09C



FIRE HYDRANT PROTECTION IN PARKING AREAS

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

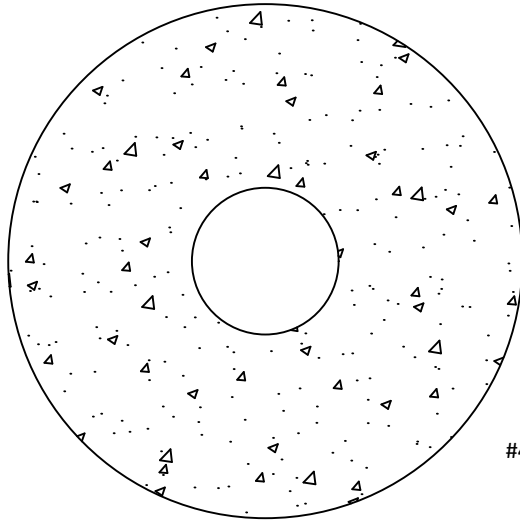
REV. NO. 01

DRAWING NO. W 09D

300

TYPE A GRADE RING

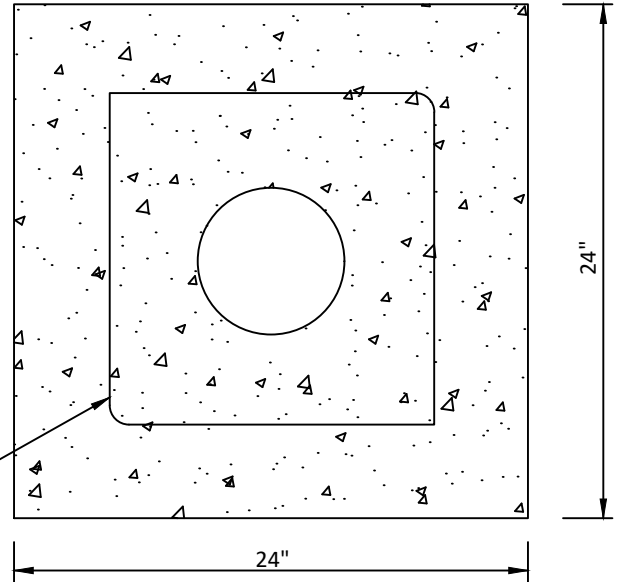
(PRECAST)



PLAN

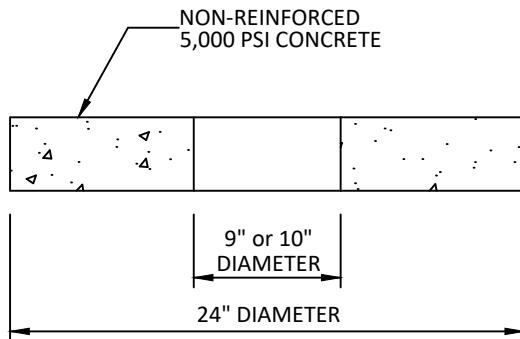
TYPE B GRADE RING

(PRECAST OR CAST IN PLACE)

#4 DEFORMED
REBAR

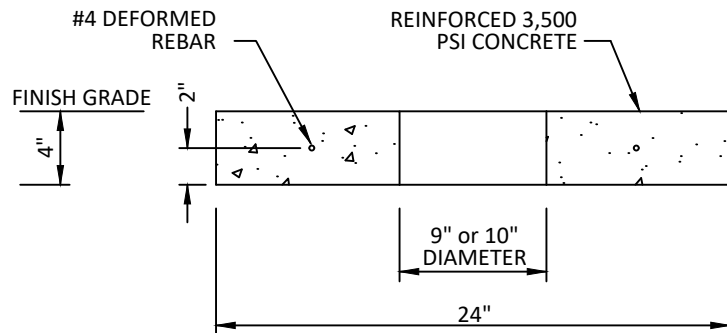
24"

24"

NON-REINFORCED
5,000 PSI CONCRETE9" or 10"
DIAMETER

24" DIAMETER

SECTION

#4 DEFORMED
REBARREINFORCED 3,500
PSI CONCRETE

FINISH GRADE

2"

9" or 10"
DIAMETER9" or 10"
DIAMETER

24"

6" IN PAVED AREAS

SECTION

NOTES:

1. CONTRACTOR TO PLACE TYPE A OR TYPE B CONCRETE GRADE RING AROUND EACH WATER LINE VALVE BOX AFTER FINAL GRADING HAS BEEN COMPLETED AND TRENCHES HAVE SETTLED.
2. CONCRETE GRADE RING TYPE B SHALL BE USED IN PAVEMENT AREAS. THICKNESS SHALL BE 6-INCHES MIN.
3. CONTRACTOR SHALL ADJUST CONCRETE GRADE RINGS AS NECESSARY IF GROUND SETTLES LATER.

VALVE BOX CONCRETE GRADE RING

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

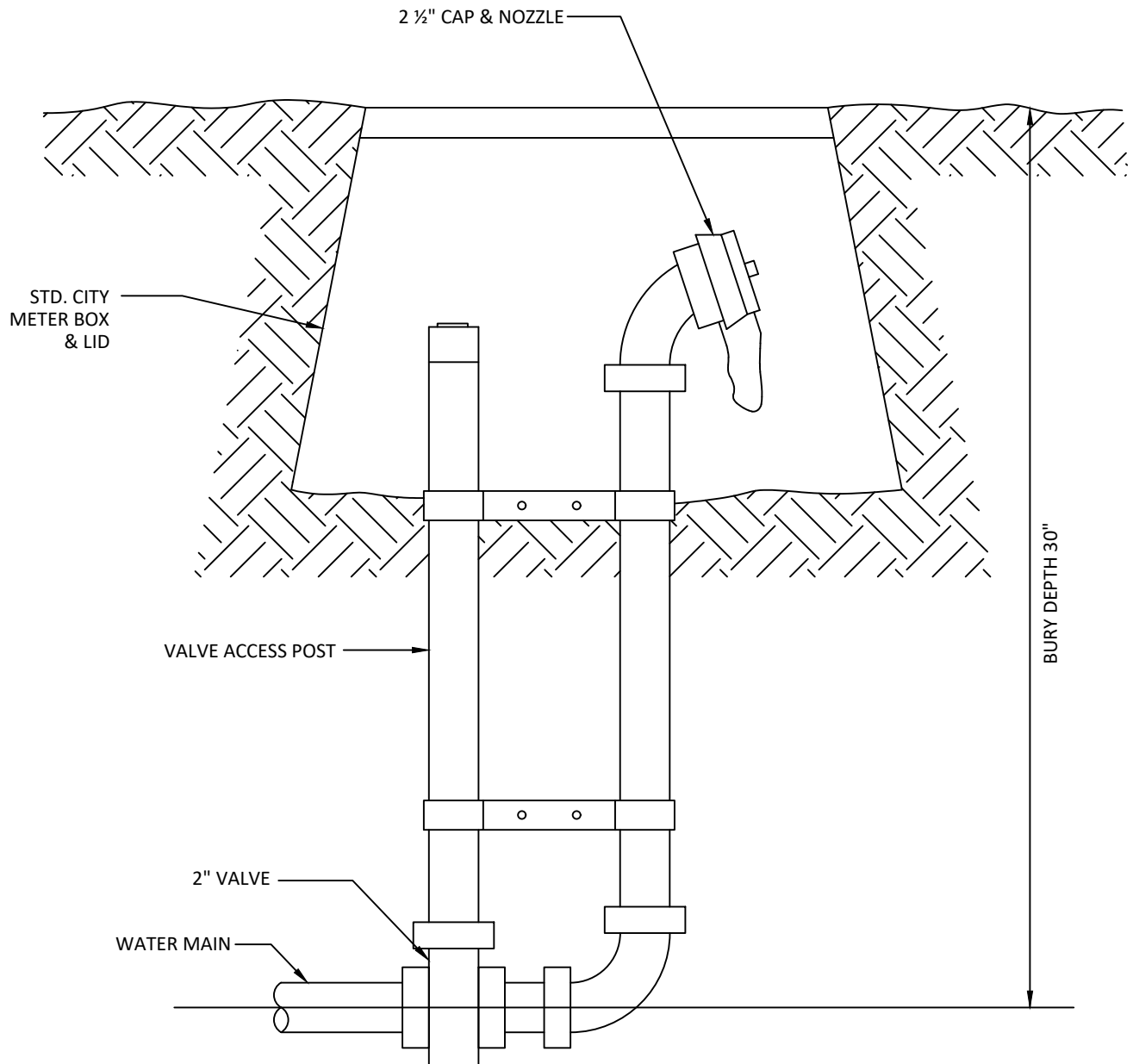
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 09E

301

**NOTES :**

1. FABRICATED HIDDEN TYPE FLUSHING HYDRANT TO BE MUELLER NO. A-410 OR EQUAL.

FLUSHING HYDRANT

CITY ENGINEER APPROVAL:

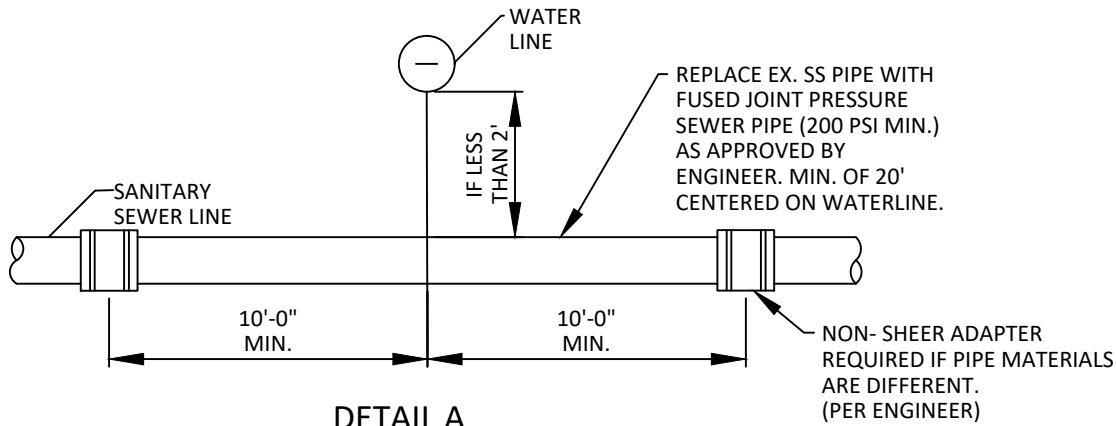
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

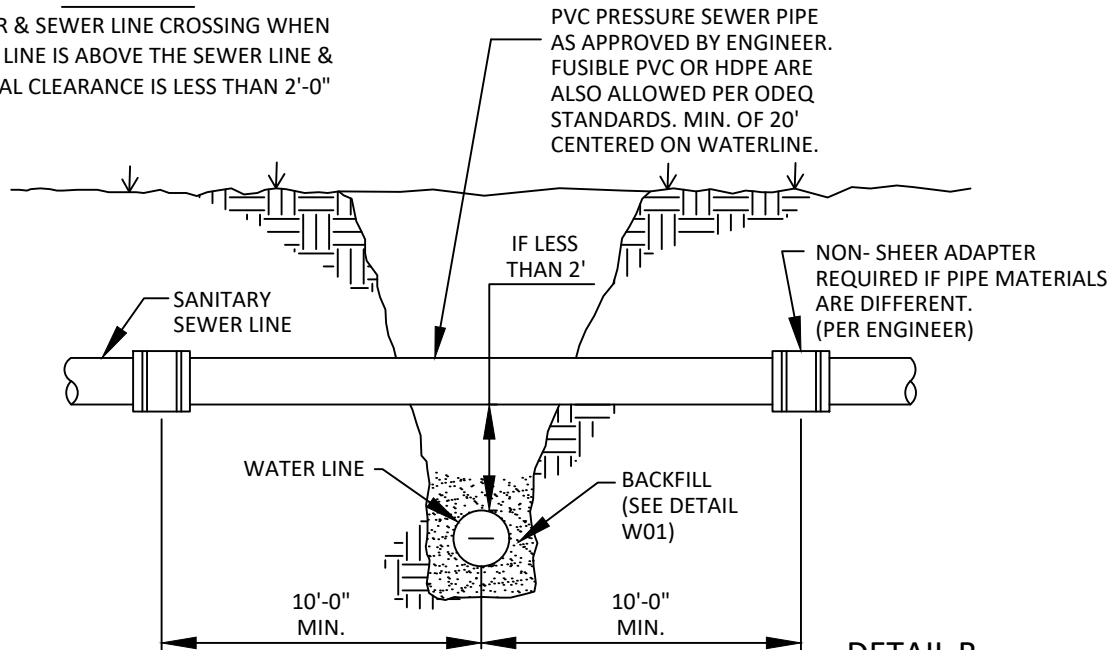
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REV. NO. 01

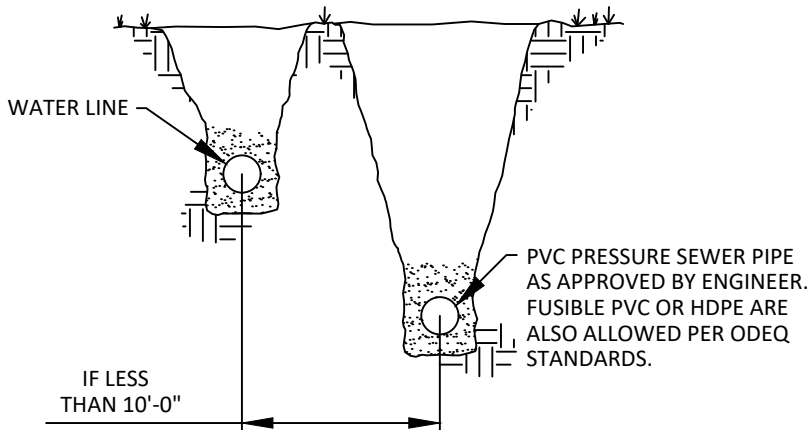
DRAWING NO. W 10

**DETAIL A**

WATER & SEWER LINE CROSSING WHEN
WATER LINE IS ABOVE THE SEWER LINE &
VERTICAL CLEARANCE IS LESS THAN 2'-0"

**DETAIL B**

WATER & SEWER LINE CROSSING WHEN
WATER LINE IS BELOW THE SEWER LINE &
VERTICAL CLEARANCE IS LESS THAN 2'-0"

**DETAIL C**

WATER & SEWER LINES WITH HORIZONTAL
CLEARANCE OF LESS THAN TEN FEET

NOTE:

1. IF LESS THAN 2-FEET CLEARANCE, WATER PIPE MAY BE ENCASED IN CONCRETE OR GROUTED STEEL PIPE.

WATER & SEWER MAIN LINE CROSSING DETAILS

CITY ENGINEER APPROVAL:

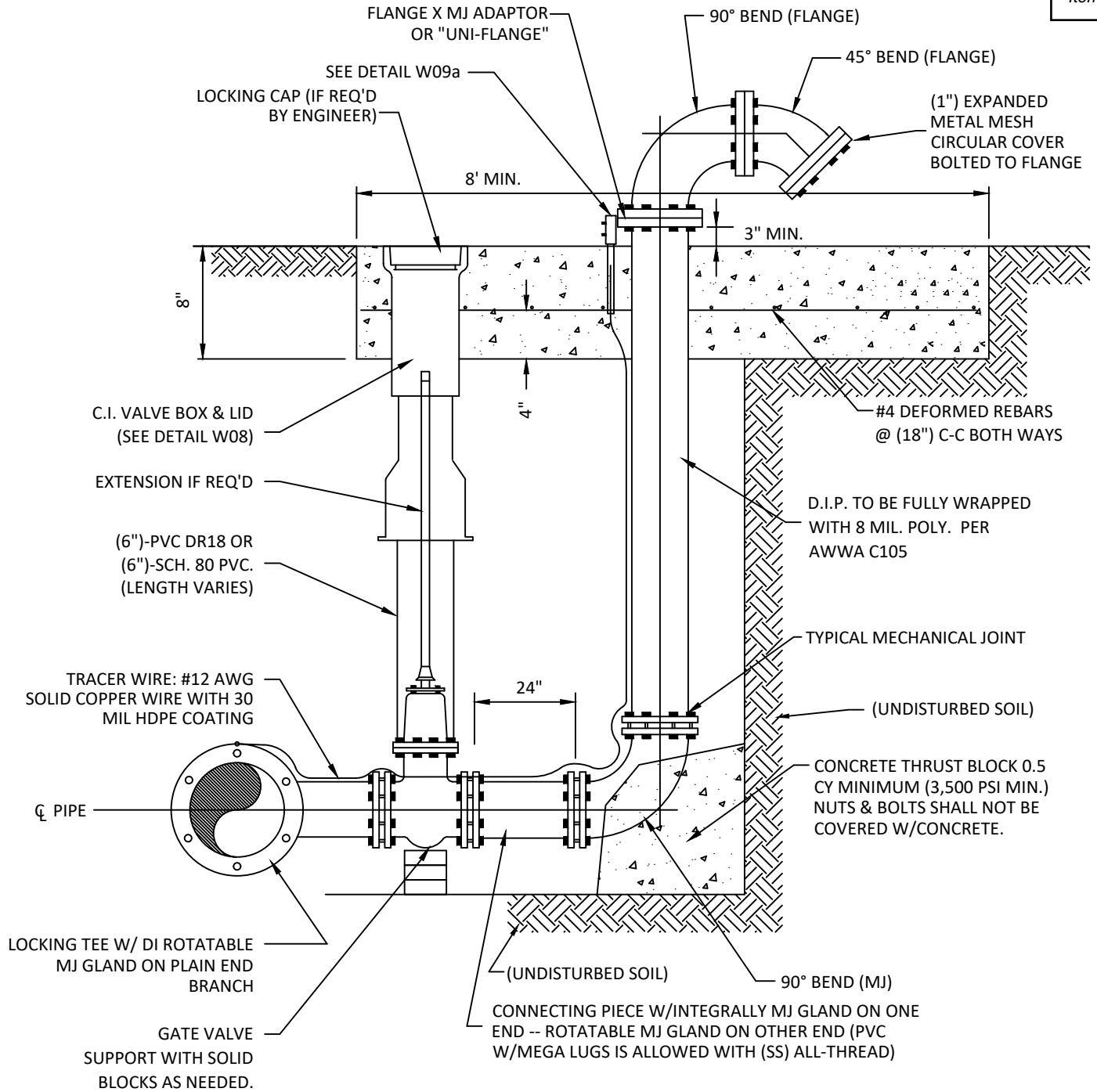
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 02

DRAWING NO. W 11

**NOTES:**

1. ALL FITTINGS (BELOW GROUND & ABOVE GROUND) TO BE EPOXY COATED WITH SS BOLTS & NUTS.
2. CONCRETE PAD TO BE 4-FEET BY 8-FEET (MIN.) BY 8-INCHES THICK AND SLOPED SO IT WILL DRAIN AWAY FROM FITTINGS.
3. PER ENGINEER, A GATE VALVE EXTENSION MAY BE REQUIRED FOR DEEP WATER LINES.
4. UNDERGROUND FITTINGS BLOCKED WITH CONCRETE TO BE FULLY WRAPPED WITH 8 MIL. POLYETHYLENE PER (AWWA C105).
5. CONCRETE FOR PAD SHALL BE 3,500 PSI @ 28 DAY. (MIN.) LARGER PAD MAYBE REQUIRED FOR LARGER PIPE.
6. BLOW OFF PIPING SIZE TO BE DETERMINED BY ENGINEER.
7. PLACE & COMPACT A MIN. OF 4-INCHES OF ODOT TYPE "A" BASE UNDER SPLASH PAD. (NOT SHOWN IN DETAIL)
8. SEE WEATHER HEAD DETAIL ON W-09a DETAIL DRAWING.
9. SLOPE ALL CONCRETE AWAY FROM FITTINGS.
10. COMPLETE ASSEMBLY SHALL COMPLETE ASSEMBLY SHALL.
11. PAD DESIGN SHALL BE CONSISTENT WITH ESTIMATED FLOWS AND SUBMITTED TO UTILITIES ENGINEER FOR APPROVAL.

WATER LINE BLOW OFF VALVE ASSEMBLY

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

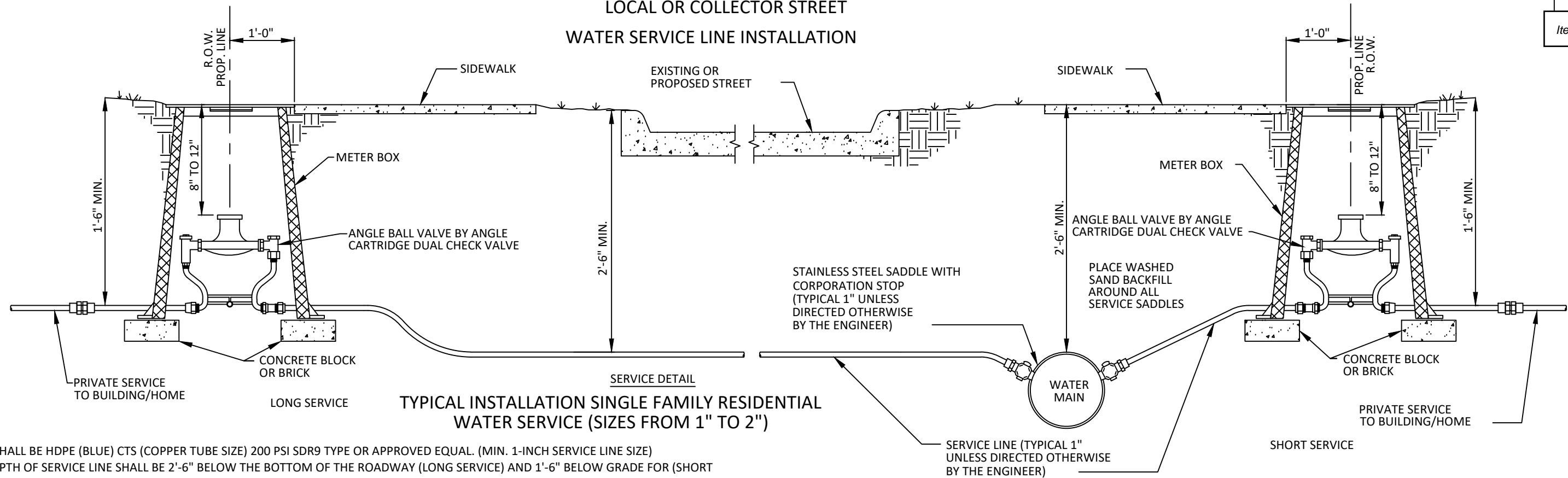
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REVISION DATE: 01/2023

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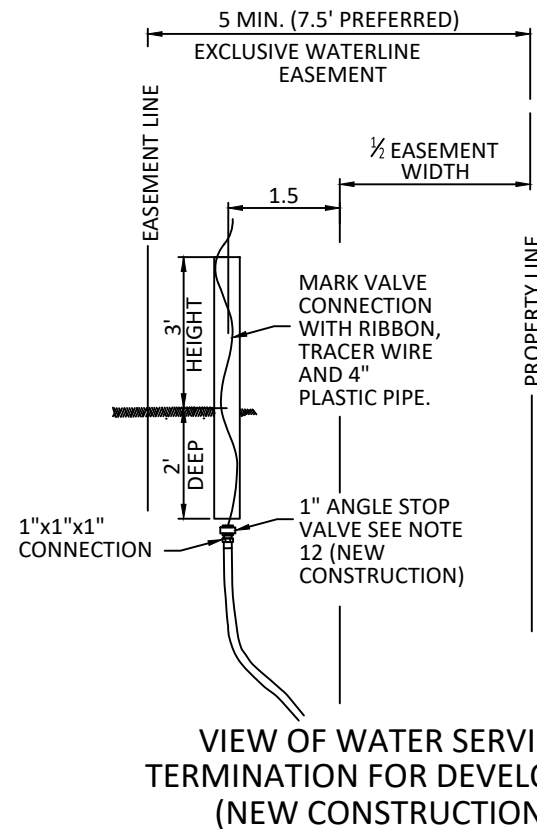
DRAWING NO. W 12

LOCAL OR COLLECTOR STREET WATER SERVICE LINE INSTALLATION



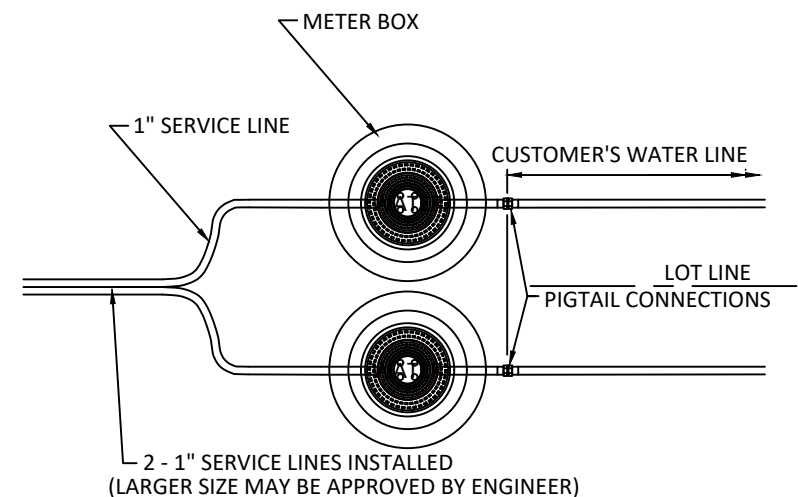
NOTES:

- SERVICE LINES SHALL BE HDPE (BLUE) CTS (COPPER TUBE SIZE) 200 PSI SDR9 TYPE OR APPROVED EQUAL. (MIN. 1-INCH SERVICE LINE SIZE)
- A MINIMUM DEPTH OF SERVICE LINE SHALL BE 2'-6" BELOW THE BOTTOM OF THE ROADWAY (LONG SERVICE) AND 1'-6" BELOW GRADE FOR (SHORT SERVICES).
- ALL SERVICE TAPS SHALL BE MADE WITH A TAPPING SADDLE FOR EITHER DUCTILE IRON PIPE OR PVC PIPE WITH AT LEAST A WALL THICKNESS OF DR18. CORPORATION THREADS SHALL UTILIZE TEFLON TAPE. SADDLES SHALL BE C-900 STAINLESS STEEL DOUBLE BOLT OR FULL WRAP AROUND TYPE WITH A 1-INCH CORPORATION PACK JOINT COMPRESSION WITH CC THREADS. ALL SERVICE TAPS SHALL BE COMPLETELY COVERED AND BACKFILLED WITH WASHED SAND.
- TAPS FOR SERVICES SHALL BE MADE HORIZONTALLY OR AT AN ANGLE UP TO 45 DEGREES, (NEVER VERTICAL UNLESS APPROVED). MULTIPLE TAPS (TWO OR MORE) ARE TO BE STAGGERED AROUND THE PIPE CIRCUMFERENCE AND BE AT LEAST 36-INCHES APART.
- COPPER METER YOKES FOR 5/8- BY 3/4-INCH WATER METER: THE COPPER METER YOKES SHALL BE "NO LEAD BRASS" HIGH GRADE BRONZE AND/OR BRASS TO EQUAL OR EXCEED AWWA SPECIFICATIONS. THE SAFE DRINKING WATER ACT (SDWA) REQUIRES THAT THESE PRODUCT WILL NEED TO MEET A WEIGHTED AVERAGE MAXIMUM LEAD CONTENT OF 0.25%. THE COPPER METER YOKES ARE FOR 5/8- BY 3/4-INCH METERS. METER YOKES MUST BE COMPLETE WITH LOCK WING STOP AND 3/4-INCH COMPRESSION CONNECTIONS FOR COPPER ON THE INLET AND OUTLET. YOKES MUST HAVE A RISER HEIGHT OF 7- OR 9-INCH END. CONNECTIONS MUST BE ASSEMBLED TO THE YOKE. THE YOKE MUST HAVE A BALL ANGLE VALVE. ALL INTEGRAL PARTS MUST BE ASSEMBLED AND READY FOR IMMEDIATE USE. IN ADDITION, METER YOKES MUST HAVE AN INTEGRAL, CARTRIDGE-STYLE, DUAL CHECK VALVE. CARTRIDGE SHOULD BE VERTICALLY INSTALLED. COPPER METER YOKES SHALL BE MUELLER CO., A.Y. MCDONALD, FORD OR APPROVED EQUAL.
- SERVICE SADDLES SHALL BE REQUIRED & SHALL BE STAINLESS STEEL (FULL WRAP AROUND TYPE PREFERRED.) WITH CC THREAD TAPS 304 (18-8) STAINLESS STEEL PER ASTM A240. FOR 3/4-INCH AND UP TO 2-INCHES. DOUBLE BAND OR TWO PIECE STAINLESS STEEL TYPE SADDLES MAY ALSO BE APPROVED BY THE ENGINEER. NO CAST D.I. ALLOWED.
- ALL SERVICE LINES SHALL BE CONTINUOUS FROM THE WATER MAIN TO THE METER BOX WITH NO SPLICES OR COMPRESSED AREAS. ALL SERVICE LINES SHALL HAVE (1) #12 AWG SOLID COPPER WIRE WITH 30MIL COATING INSTALLED ALONG THE SERVICE LINE FROM THE WATER MAIN TO THE METER BOX. TRACER WIRE SHALL EXTEND 12-INCHES BEYOND ANGLE STOP. SERVICE LINE TRACER WIRES SHALL BE CONNECTED TO THE WATER MAIN TRACER WIRE WITH AN APPROVED UNDERGROUND CONNECTOR. ALL TRACER WIRES SHALL BE TESTED FOR CONTINUITY PRIOR TO THE WATERLINE BEING ACCEPTED. ALL SERVICES SHALL HAVE STAINLESS STEEL INSERTS AT EACH END.
- METER BOXES SHALL BE INSTALLED WITH CONCRETE BLOCKING (SOLID BRICK) UNDER EACH BOX TO SUPPORT IT FROM SETTLING. BOXES SHALL BE INSTALLED SO TOP IS PARALLEL TO THE EXISTING GROUND. BOXES SHALL BE CENTERED OVER THE EXISTING WATER METER SO AS TO ALLOW EASY ACCESS TO THE ANGLE METER STOP FROM ABOVE.
- SMALL METER BOX: (3/4-INCH METER) SHALL BE "OLDCASTLE" CARSON SPECIFICATION GRADE MODEL 2200 18-INCHES DEEP HDPE BOX WITH A CAST IRON COVER OR EQUAL, MANUFACTURED BY THE SAME. THE CAST IRON COVER SHALL INDICATE WATER METER IN THE CASTING. A TRAFFIC RATED COVER & BODY MAY BE REQUIRED AND APPROVED BY THE ENGINEER FOR TRAFFIC LOCATIONS. COVER SHALL BE LOCKING TYPE.
- MEDIUM METER BOX: (FOR 1 1/2-INCH METER) SHALL BE "OLDCASTLE" CARSON SPECIFICATION GRADE MODEL 1324 15-INCHES DEEP HDPE BOX WITH A MODEL 1324 HDPE FLUSH MOUNT COVER WITH A CAST IRON READER DOOR AND LOCKING DEVICE OR APPROVED EQUAL.
- LARGE METER BOX: (FOR 2-INCH METER) SHALL BE "OLDCASTLE" CARSON SPECIFICATION GRADE MODEL 1730 18-INCHES DEEP HDPE BOX WITH A MODEL 1730 HDPE FLUSH MOUNT COVER WITH A CAST IRON READER DOOR AND LOCKING DEVICE OR APPROVED EQUAL.
- ANGLE STOP BALL VALVE SHALL BE USED AT THE END OF SERVICE LINE, WITH PACK JOINT CONNECTION. ANGLE STOP BALL VALVE SHALL MEET THE APPLICABLE REQUIREMENT OF AWWA C800, ASTM B-62 FOR 85-5-5-5 COMPOSITION BRONZE, AND USAS B2.1. ANGLE STOP BALL VALVE SHALL BE MUELLER, MCDONALD, FORD OR APPROVED EQUAL. ANGLE BALL SERVICE VALVE REFERENCE NO. BA 41-444W FULL PORT VALVE OR APPROVED EQUAL. COVER ANGLE STOP BALL VALVE WITH POLYETHYLENE, MINIMUM (3MIL) THICKNESS, TO PREVENT ENTRY OF ANY FOREIGN MATERIALS. TYPICALLY, AN ANGLE BALL VALVE BY ANGLE CARTRIDGE DUAL CHECK VALVE (5/8-INCH BY 3/4-INCH METER), (1 1/2-INCH METER), OR (2-INCH METER) SHALL BE USED UNLESS OTHERWISE APPROVED BY THE ENGINEER. SEE TERMINATION DETAIL FOR NEW CONSTRUCTION.



NOTE:

- BLUE "MAGNITIZED" PLASTIC RIBBON TAPE SHALL BE TIED TO THE VALVE AND EXTENDED 18-INCHES ABOVE FINISH GRADE TO MARK VALVE CONNECTION LOCATION. INSTALL A (4-INCH DIA. BY 5-FOOT) PLASTIC SCH. 40 PVC PIPE AT THE SAME LOCATION AND EXTEND THE TRACER WIRE 18-INCHES ABOVE FINISHED GRADE AND COIL WIRE AROUND PVC PIPE.



PLAN VIEW OF SIDE BY SIDE WATER METER INSTALLATION

THIS STANDARD INDICATES THE DESIRED GEOMETRIC CONFIGURATION REFERENCED TO STREET PAVINGS AND PROPERTY LINES. THE 2, 1-INCH SERVICE LINES SHOWN IN THE UNDER STREET CROSSING IS RECOMMENDED BY THE CITY. PRIOR TO INSTALLATION BY CONTRACTOR, ACTUAL SIZE SHALL BE DETERMINED BY THE ENGINEER.

ENGINEERING DIVISION, CITY OF NORMAN

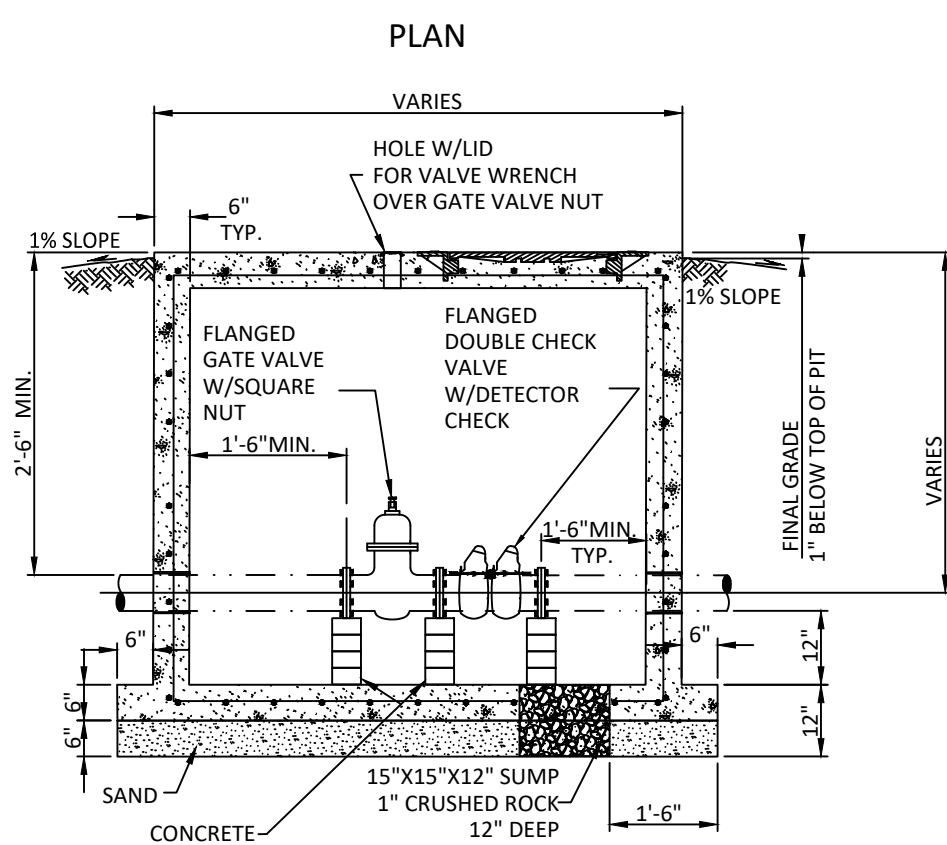
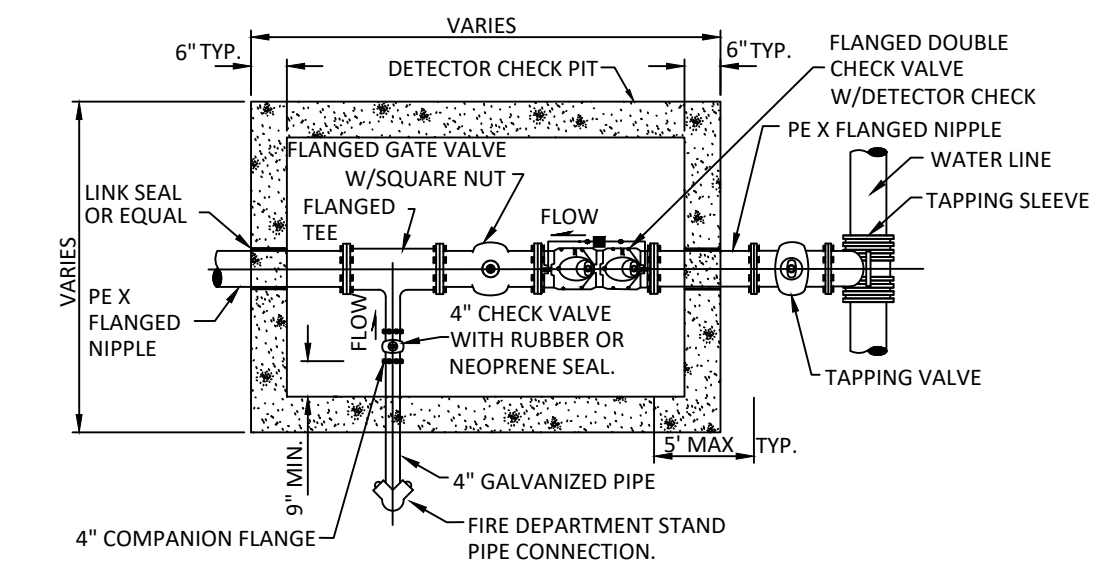
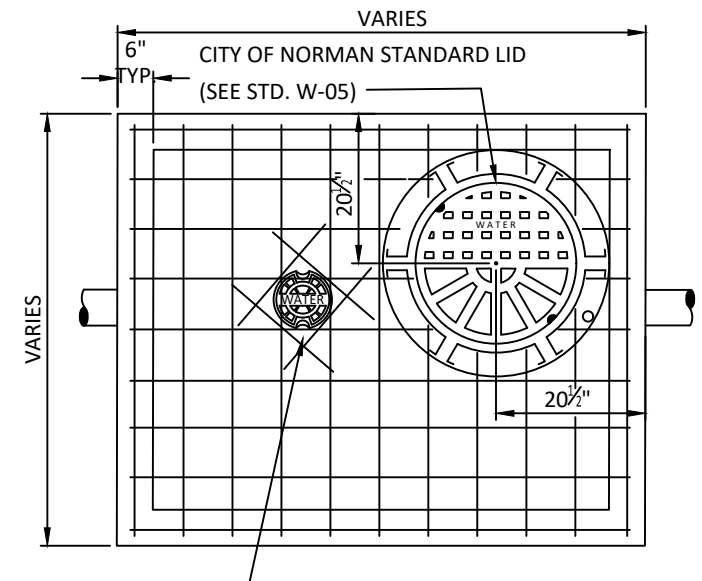
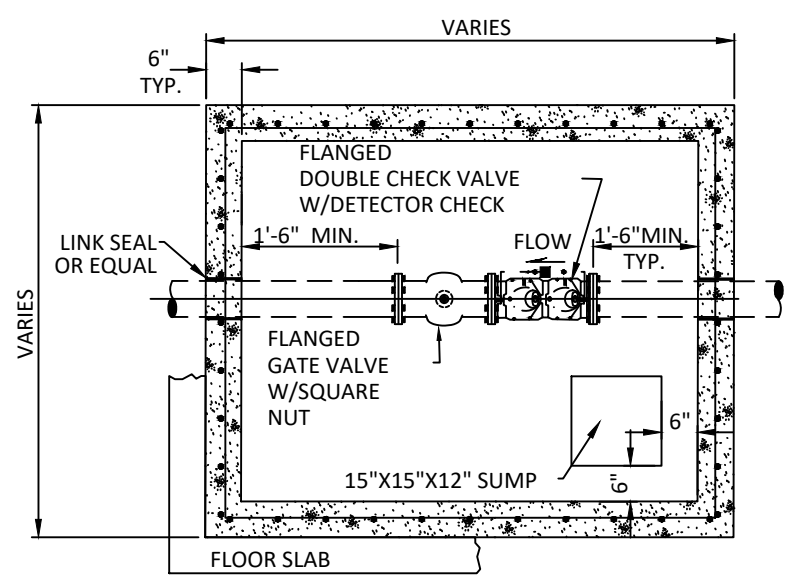
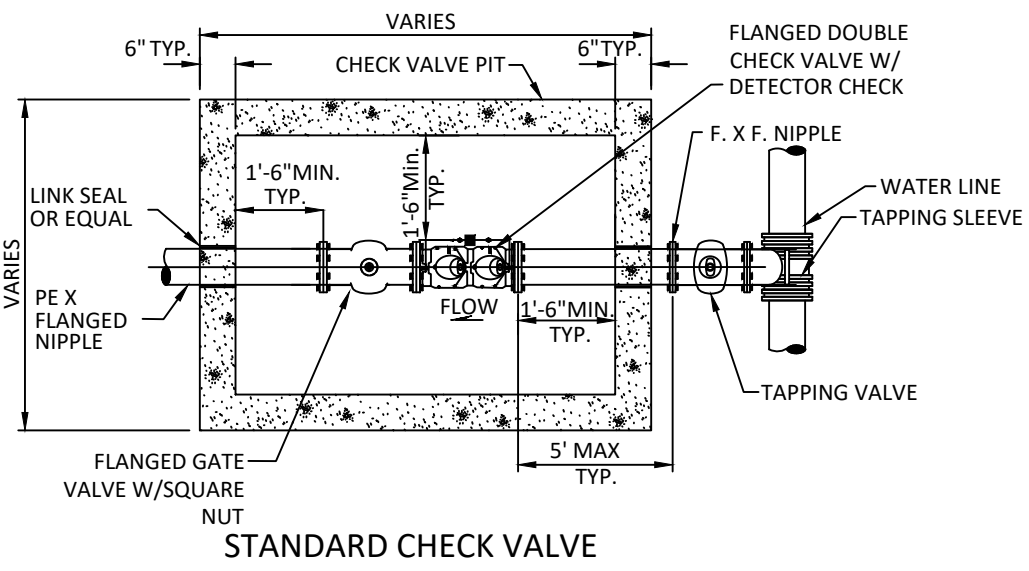
WATER METER SERVICE CONNECTION INSTALLATION

APPROVED BY:
CITY ENGINEER

DATE: 01/2023

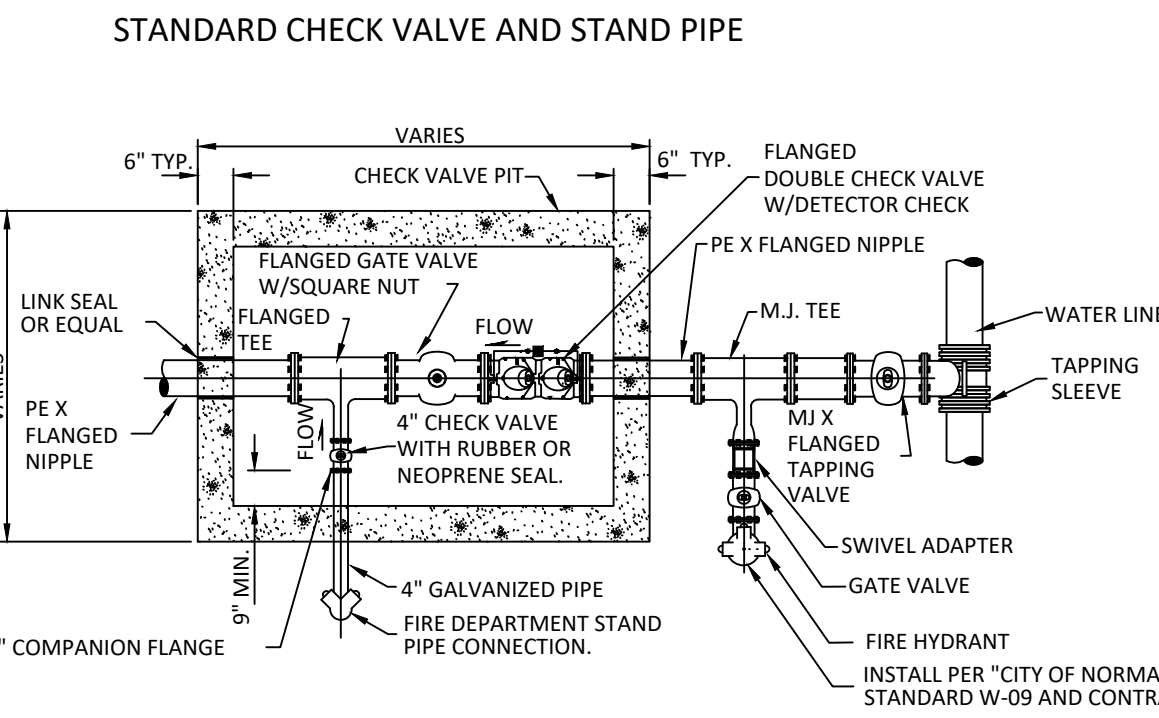
DRAWING NO: W 13

Item 6.



STANDARD VALVE BOX, TOP SECTION AND LID ONLY. CENTERED OVER VALVE NUT (SEE STD. W-08)

PLAN OF TOP SECTION



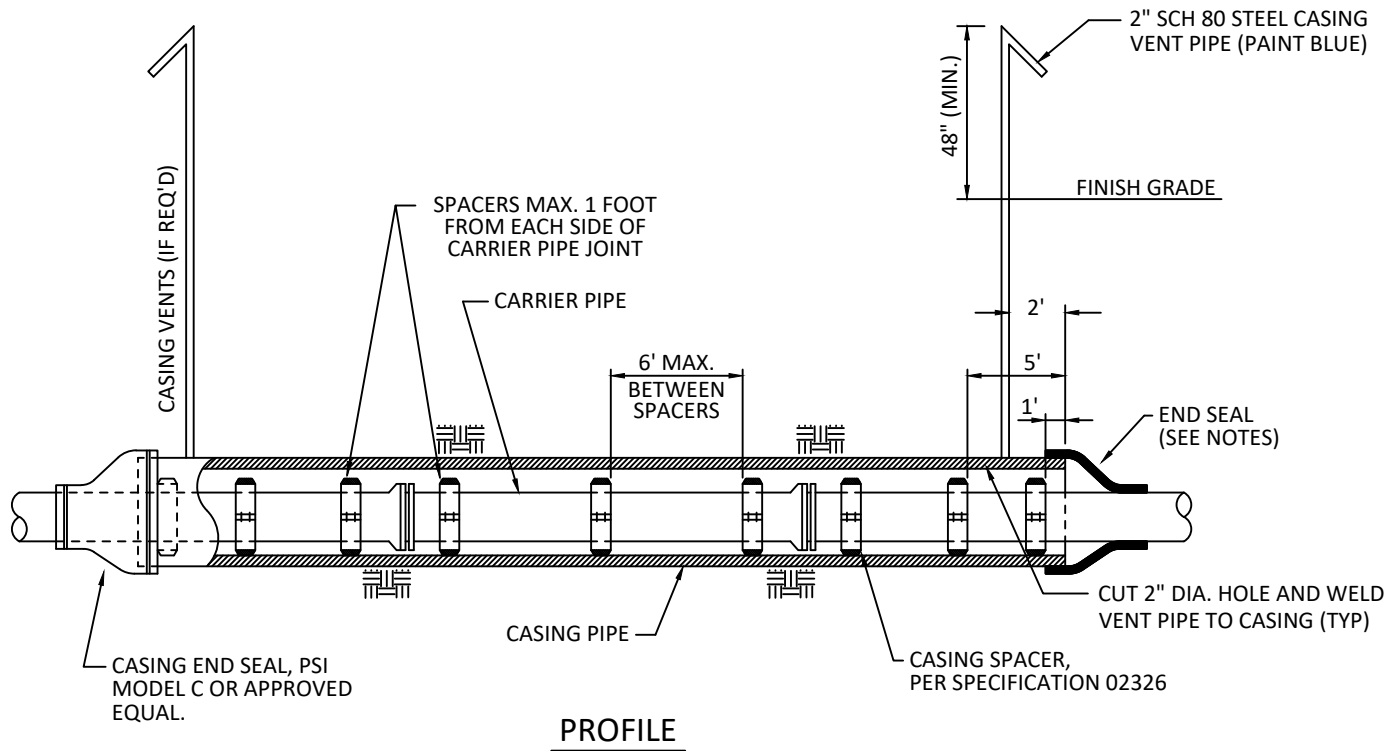
ELEVATION

STANDARD METER PIT FOR STANDARD CHECK VALVE, STANDARD CHECK VALVE WITH FIRE HYDRANT AND STAND PIPE OR STANDARD CHECK VALVE AND STAND PIPE

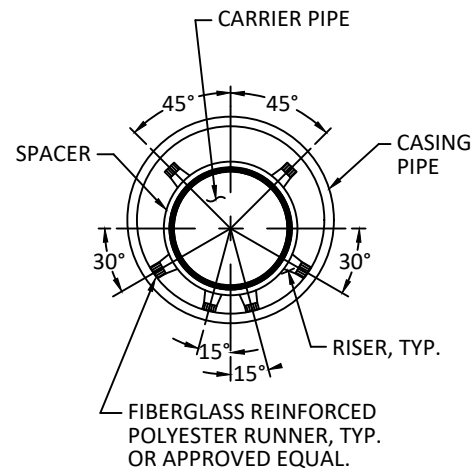
- NOTES:
1. A MINIMUM CLEARANCE OF 18-INCHES FROM THE BODY OR FLANGES OF WATERLINE VALVES AND OTHER DEVICES TO THE INSIDE WALL OF THE PIT EXCEPT AS SHOWN OR NOTED.
 2. VAULT TO BE CONSTRUCTED OF CLASS A CONCRETE AS PER ODOT SECTION 701.01 WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,500 PSI
 3. REINFORCING STEEL SHALL BE GRADE 60, #4 BARS AT 8" CENTERS
 4. FLOOR, WALLS & TOP MAY BE POURED SEPARATE WITH THE USE OF STEEL TIES AT ALL CONSTRUCTION JOINTS.
 5. VALVE VAULT TO BE LOCATED ON PUBLIC PROPERTY OR IN A DESIGNATED UTILITY EASEMENT.
 6. ALL EXTERIOR METAL SURFACES TO BE PAINTED A FIRE HYDRANT RED.
 7. IF DOUBLE DETECTOR CHECK IS INSTALLED AS SHOWN, THE FIRE DEPARTMENT DOES NOT REQUIRE A DOUBLE CHECK VALVE IN BUILDING. HOWEVER, THE OWNER HAS THE OPTION OF INSTALLING ONLY A SINGLE DETECTOR CHECK VALVE AT THE WATER MAIN AND A DOUBLE CHECK VALVE IN THE BUILDING. IF THIS OPTION IS CHOSEN, THEN A SINGLE READ CHECK VALVE SHOULD BE LOCATED OFF THE WATER MAIN.
 8. THE GATE VALVE SHOWN INSIDE THE VAULT MAY BE LOCATED JUST OUTSIDE THIS VAULT TOWARD THE BUILDING.
 9. ALTERNATE DESIGNS SHALL BE REVIEWED BY THE UTILITIES ENGINEER.

STANDARD CHECK VALVE WITH FIRE HYDRANT AND STAND PIPE

ENGINEERING DIVISION, CITY OF NORMAN		
FIRE LINE STANDARD		
APPROVED BY: _____ CITY ENGINEER	DATE: 01/2023	DRAWING NO: W 14

**NOTES:**

1. FOR OPEN TRENCH CONSTRUCTION OF CASING PIPE, AS A MINIMUM REQUIREMENT USE SELECT MATERIAL FOR EMBEDMENT AND BACKFILLING.
2. ALL CARRIER PIPE JOINTS WITHIN CASING PIPE SHALL BE RESTRAINED PER SPECIFICATIONS.
3. CASING VENT PIPES ARE ONLY REQUIRED IN ODOT ROW AND AS SHOWN IN THE PLANS.
4. VENT PIPES SHALL BE WELDED TO TO CASING PIPE BEFORE THE CARRIER PIPE IS INSTALLED.
5. CASING END MAY BE SEALED WITH FAST SETTING INSULATION SPRAY FOAM IN LIEU OF A CASING END SEAL. FOAM MUST EXTEND A MIN. OF 24-INCHES INSIDE CASING.



(STANDARD SPACER POSITION)

END VIEW**BORE WITH CASING DETAIL**

CITY ENGINEER APPROVAL:

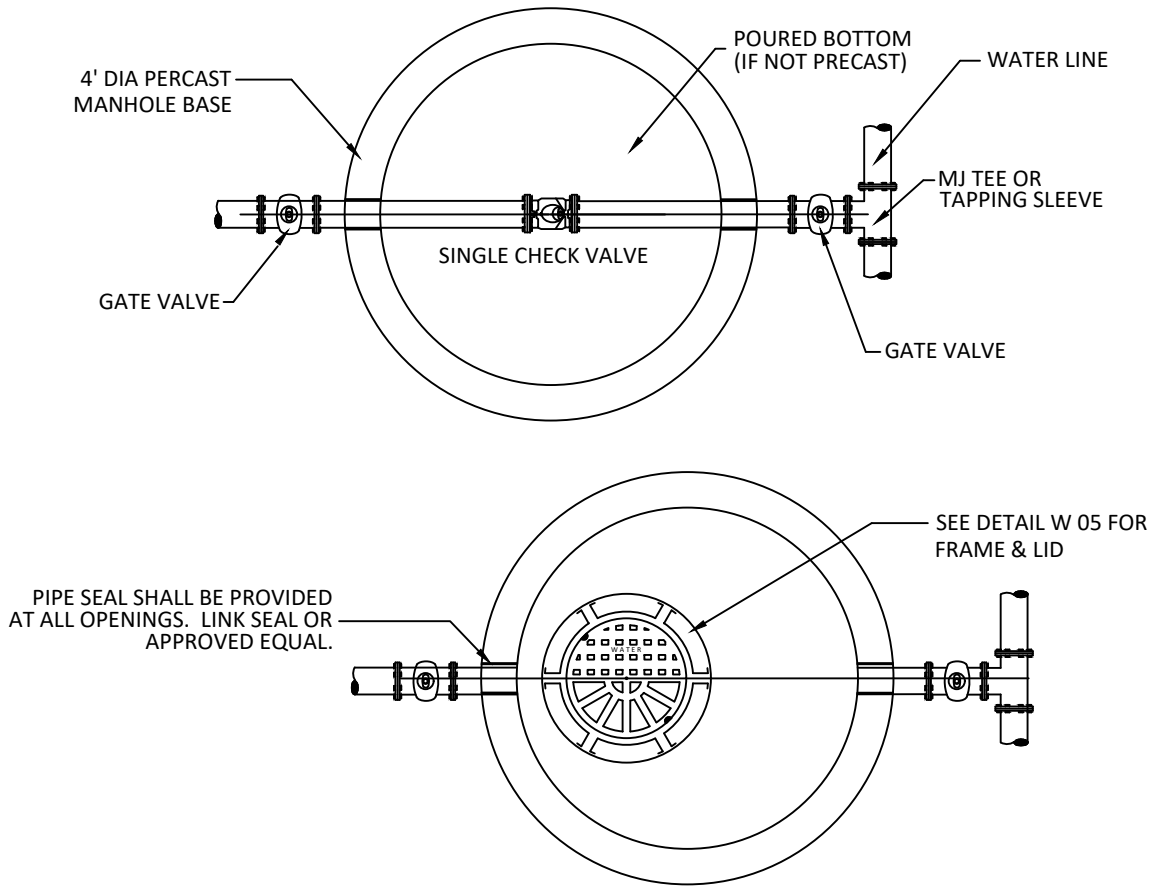
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

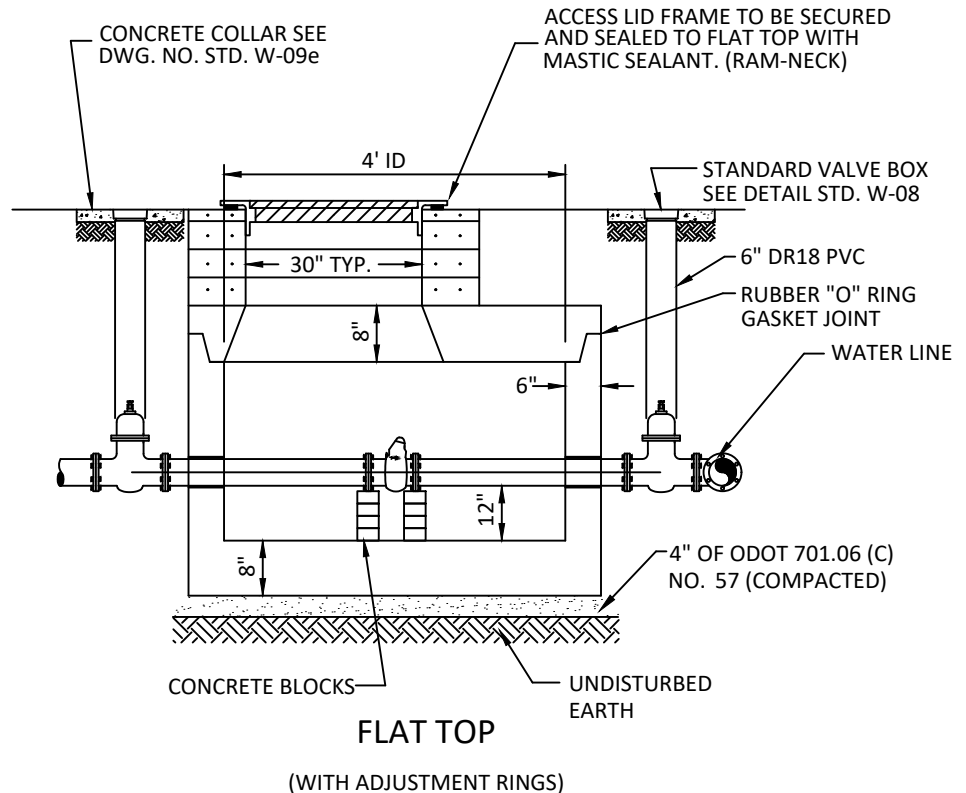
REV. NO. 01

DRAWING NO. W 19



NOTES:

1. MH SHALL CONFORM TO CURRENT ASTM C-478.
2. MIN. CONCRETE STRENGTH TO BE ODOT CLASS A, 3,500 PSI @ 28 DAYS.
3. DEPTH IS VARIABLE
4. IF POOR SOIL CONDITIONS ARE ENCOUNTERED, DEPTH SHALL BE OVER EXCAVATED AND STABILIZED WITH AGG., BASE.
5. SINGLE CHECK MANHOLE MUST BE LOCATED ON PRIVATE PROPERTY ADJACENT TO THE RIGHT-OF-WAY.
6. SINGLE CHECK VALVE MUST HAVE DETECT METER AND SHALL BE ZURN MODEL 310.
7. EXTEND TRACER WIRE FROM THE MAIN INTO THE VAULT A MIN. OF 24-INCHES.
8. IF THE WATER LINE DEPTH ALLOWS, A STANDARD MH CONE SECTION CAN BE USED IN LIEU OF FLAT TOP.
9. CONTRACTOR TO INSTALL 2- OR 4-INCH REINFORCED CONCRETE CONCENTRIC ADJUSTMENT RINGS AS FINISH GRADE REQUIRES, SECURED, & SEALED WITH RUBBER RINGS OR MASTIC (RAM-NECK) 24-INCHES MAX HEIGHT.
10. TOP OF FRAME TO BE 2 1/2-INCHES ABOVE SURROUNDING GROUND (TYP).



FIRE LINE SINGLE CHECK VALVE MANHOLE

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

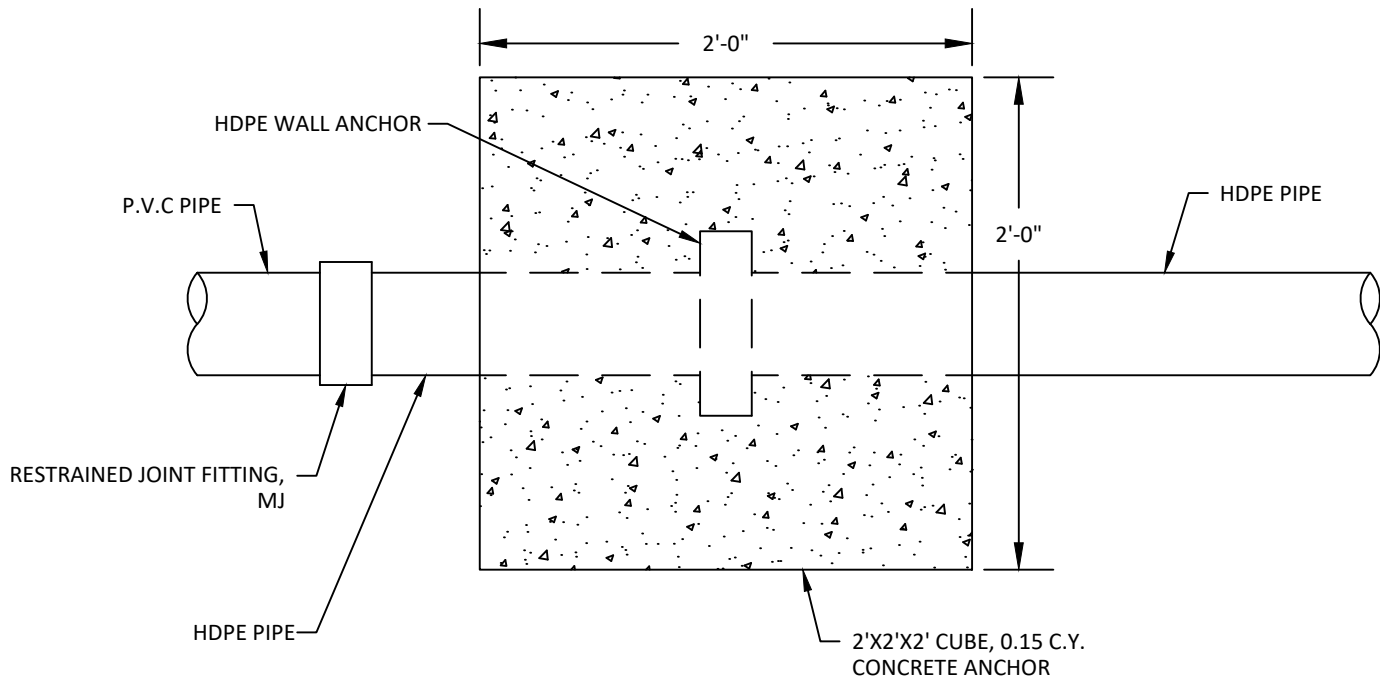
APPROVAL DATE:

REVISION DATE: 01/2023

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DRAWING NO. W 20

309

**NOTES:**

1. 2-FEET BY 2-FEET BY 2-FEET CONCRETE ANCHOR REQUIRED FOR PIPE SIZES UP TO 8-INCHES. ANCHORS FOR PIPE SIZES LARGER THAN 8-INCHES MUST BE APPROVED BY UTILITIES ENGINEER.
2. ALL PVC TO PE TRANSITIONS SHALL BE MADE AS SHOWN ON THIS DETAIL AND PER MANUFACTURER'S RECOMMENDATIONS.
3. USE ADAPTER KIT FUSED ON TO PE BUTT FUSION TO HDPE TO RESTRAINED MJ TO PVC INSTALL CONCRETE ANCHOR.
4. WHEN HDPE PIPE IS CONNECTED TO DI FITTING, USE HDPE MJ ADAPTER AND DI REDUCER AS NECESSARY TO MAKE CONNECTION.

PVC TO HDPE CONNECTION

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

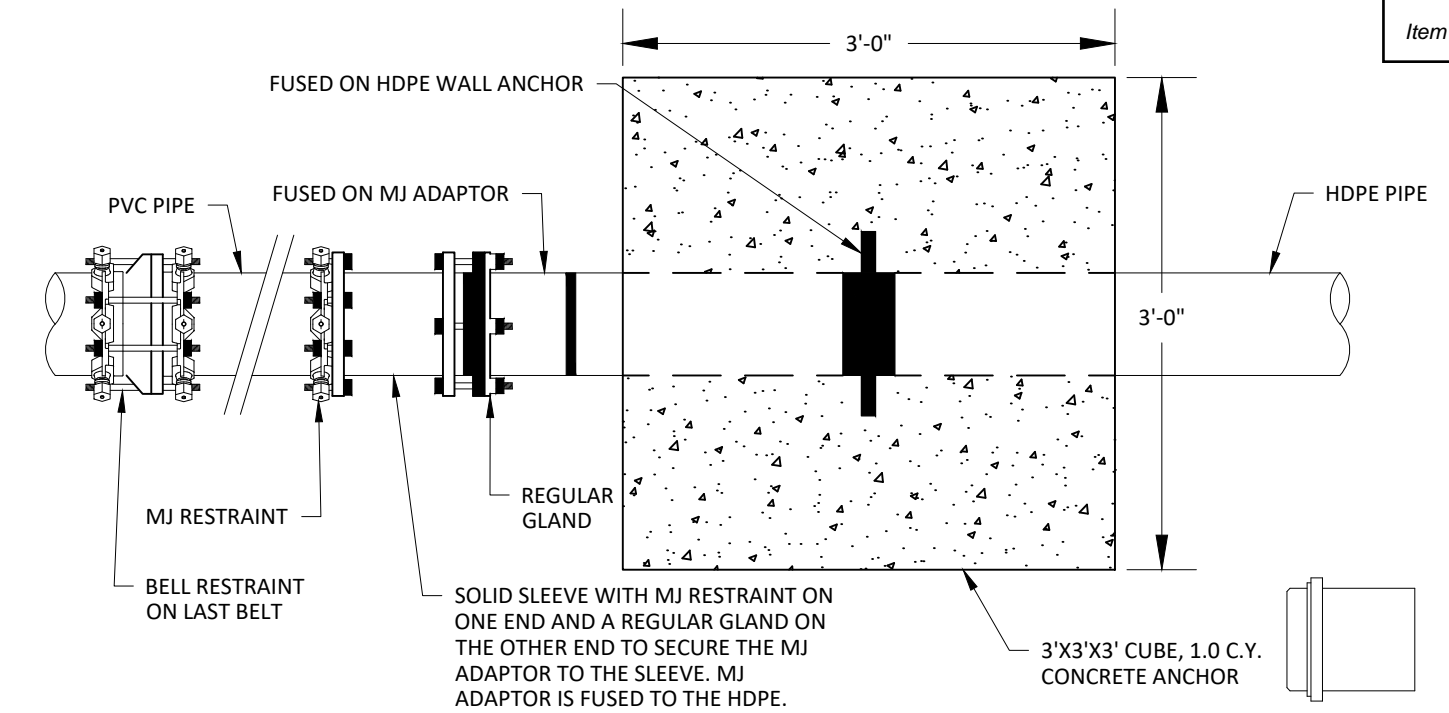
APPROVAL DATE:

REVISION DATE: 01/2023

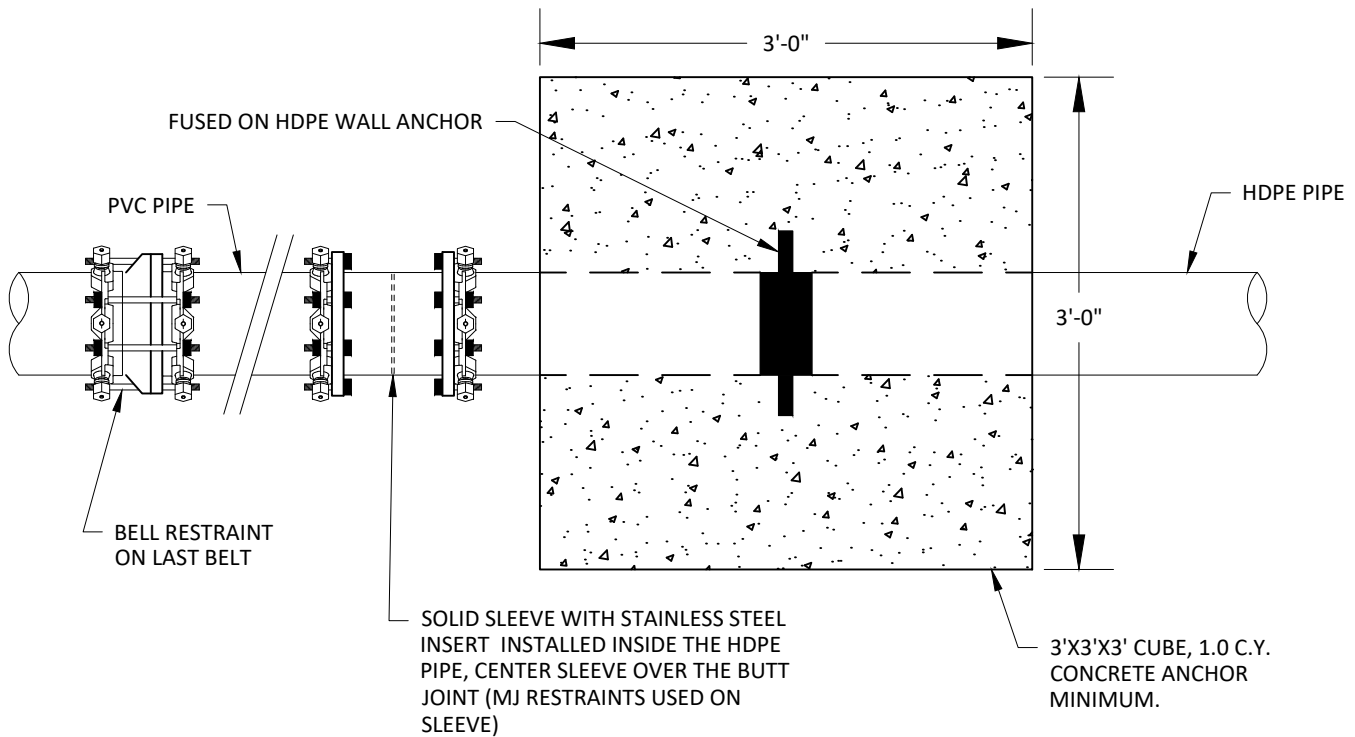
REV. NO. 01

DRAWING NO. W 21

310



OPTION A



OPTION B

NOTE:

1. ANCHOR BLOCK SIZE MAY BE INCREASED OR DECREASED PER THE ENGINEER.

PVC TO HDPE TRANSITION WITH WALL ANCHOR BLOCK

CITY ENGINEER APPROVAL:

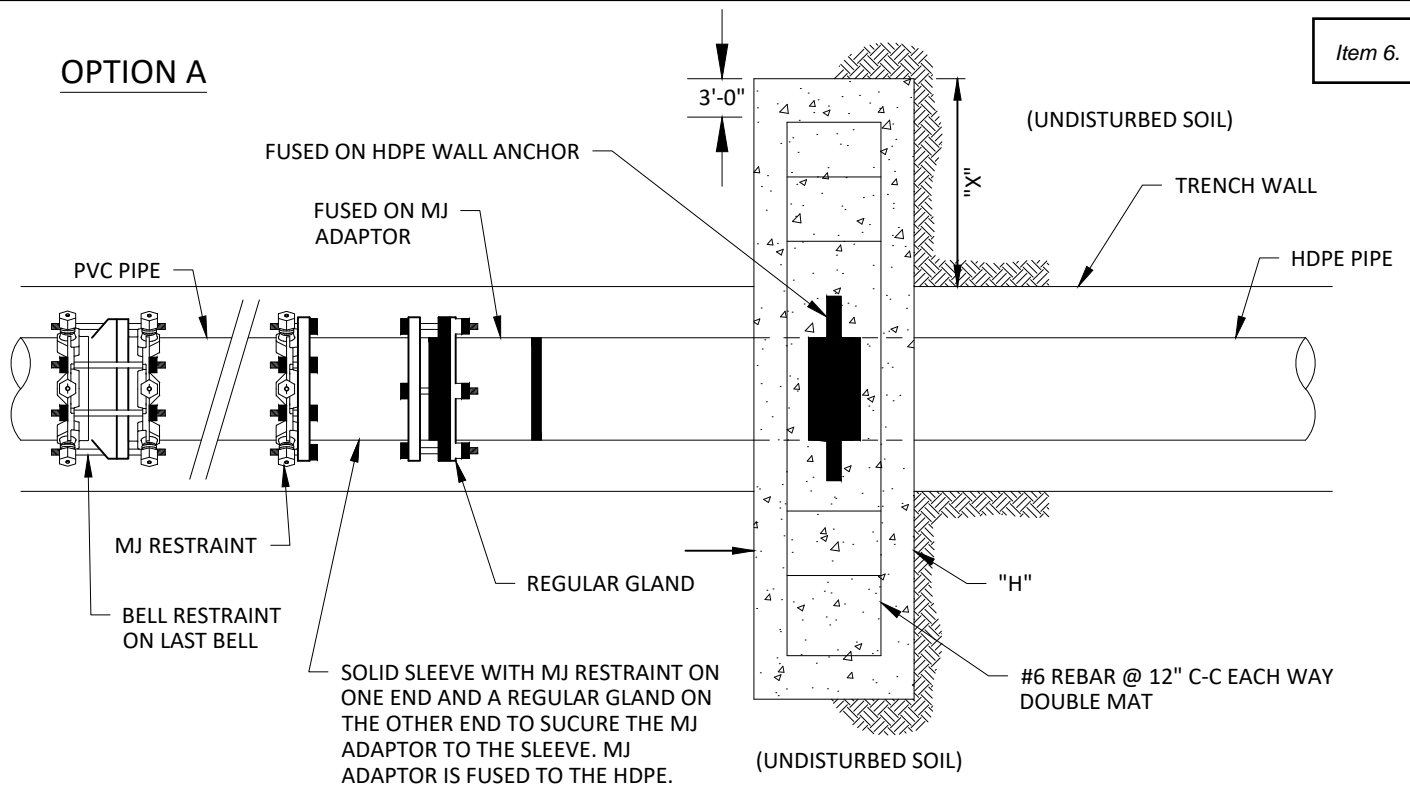
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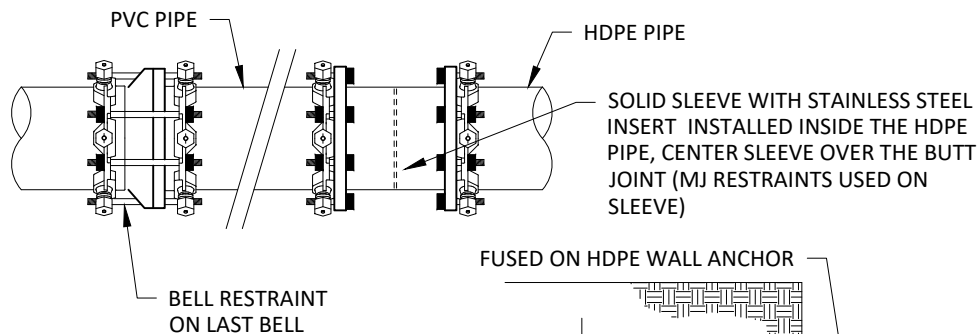
REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W-21A

OPTION A

DIPS PIPE SIZE (DR11)	PRESSURE	"X" (IN)	"AX" (IN)	"AY" (IN)	"H" (IN)
8"	150 PSI	30	90	36	18
10"	150 PSI	36	102	42	18
12"	150 PSI	45	120	48	24

**OPTION B**

#6 REBAR @ 12" C-C EACH WAY
DOUBLE MAT

OPTION A & B BOTH REQUIRE
A CONCRETE WALL ANCHOR
BLOCK.

NOTE

1. ANCHOR BLOCK SIZE MAY BE INCREASED OR DECREASED PER ENGINEER.
2. OPTION A & B BOTH REQUIRE A CONCRETE WALL ANCHOR BLOCK.

PVC TO HDPE TRANSITION WITH WALL ANCHOR BLOCK

CITY ENGINEER APPROVAL:

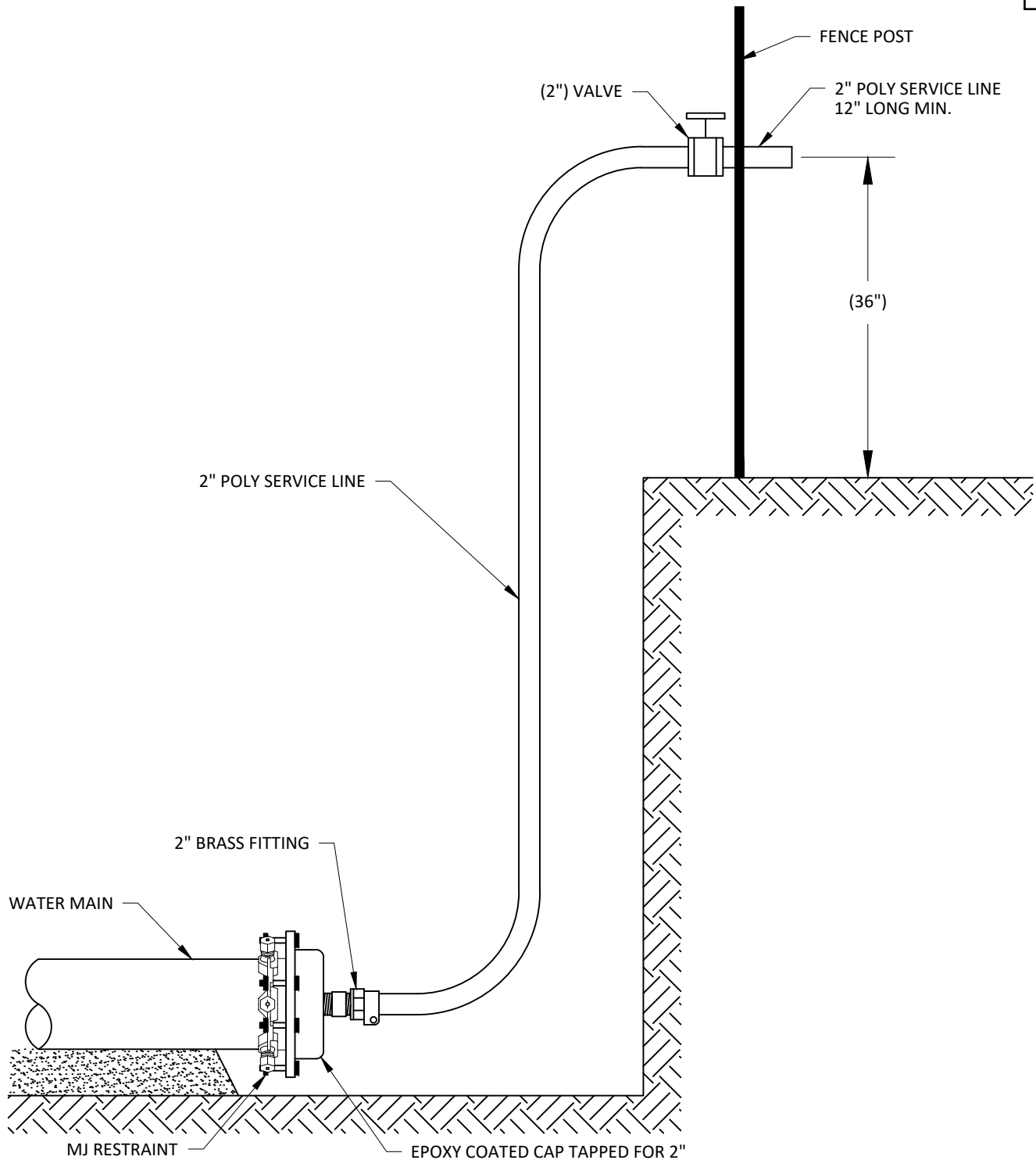
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W-21B

**NOTES:**

1. INSTALL 2" GATE OR BALL VALVE AS SHOWN.
2. SECURE 2" POLY TO FENCE POST AS SHOWN.
3. NO GALVANIZED MATERIALS MAY BE USED.
4. NO "LIQUID PIPE DOPE" SHALL BE USED.

SAMPLING/FLUSHING TAP ON 4"-8" PVC WATERLINES

CITY ENGINEER APPROVAL:

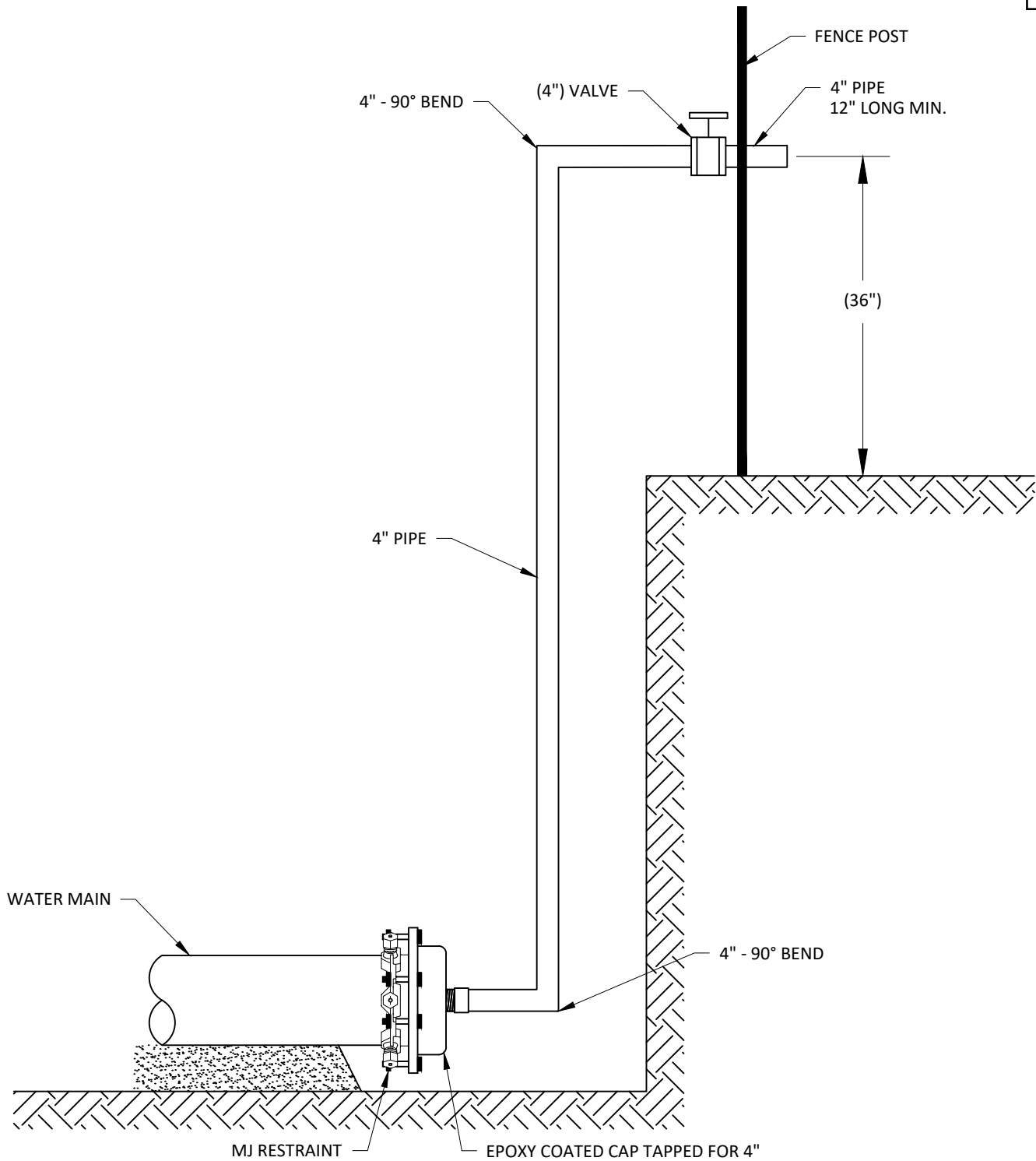
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 22



NOTES:

1. INSTALL 4" GATE OR BALL VALVE AS SHOWN
2. SECURE 4" PIPE FOR TESTING AND FLUSHING
3. NO GALVANIZED MATERIALS MAY BE USED
4. NO "LIQUID PIPE DOPE" SHALL BE USED

4" SAMPLING/FLUSHING TAP ON 12" PVC WATERLINES

CITY ENGINEER APPROVAL:

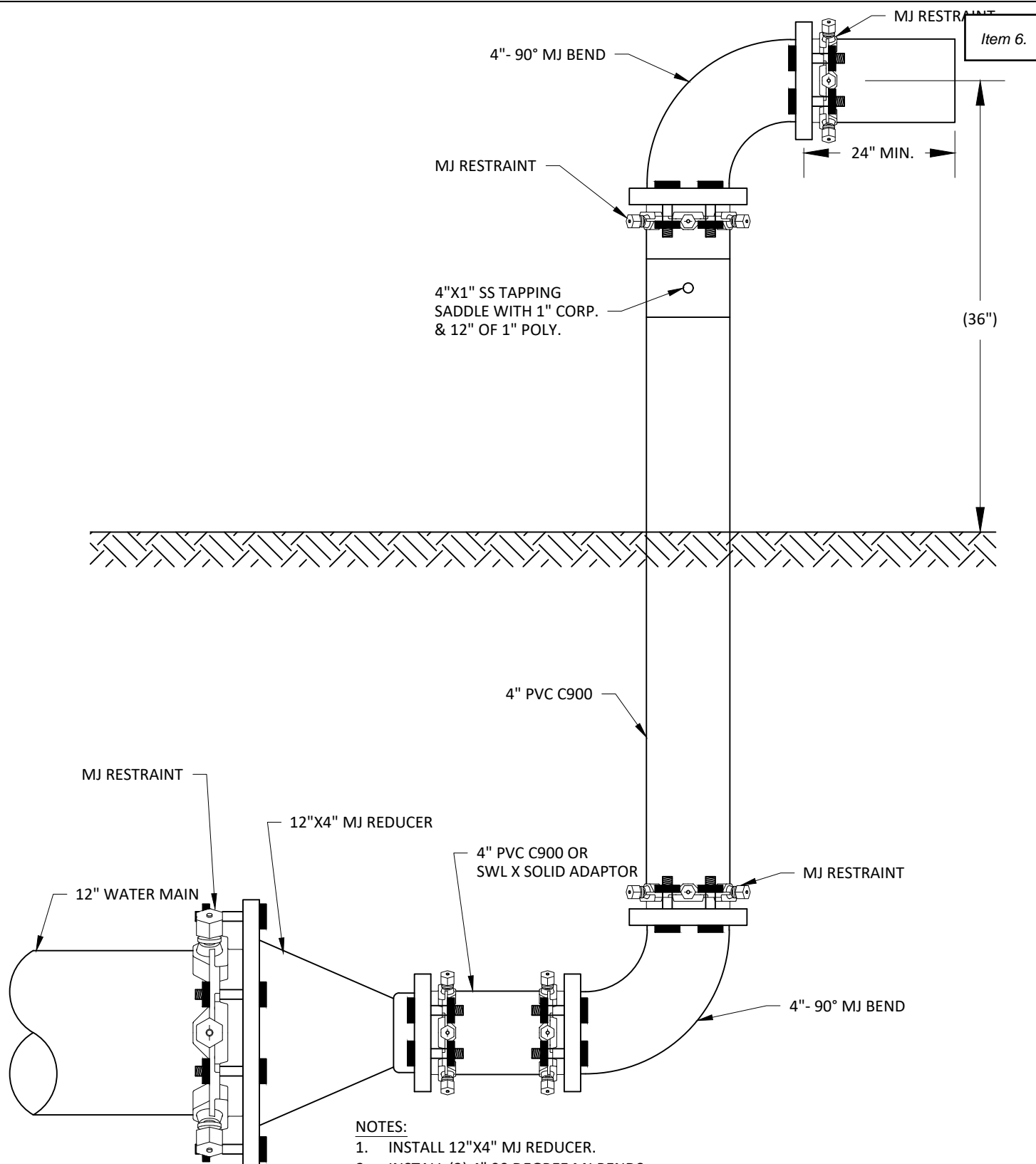
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 22A



NOTES:

1. INSTALL 12"x4" MJ REDUCER.
2. INSTALL (2) 4" 90 DEGREE MJ BENDS.
3. INSTALL 4"x1" SS TAPPING SADDLE.
4. SEAL OPEN END OF WATERLINE AFTER FLUSHING.
5. CONTRACTOR MAY INSTALL 45 DEGREE MJ FITTINGS INSTEAD OF 90 DEGREE BENDS AS SHOWN IN ORDER TO DAYLIGHT OUT THE PIPE FOR TESTING.

SAMPLING/FLUSHING TAP ON 12" PVC WATERLINES

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

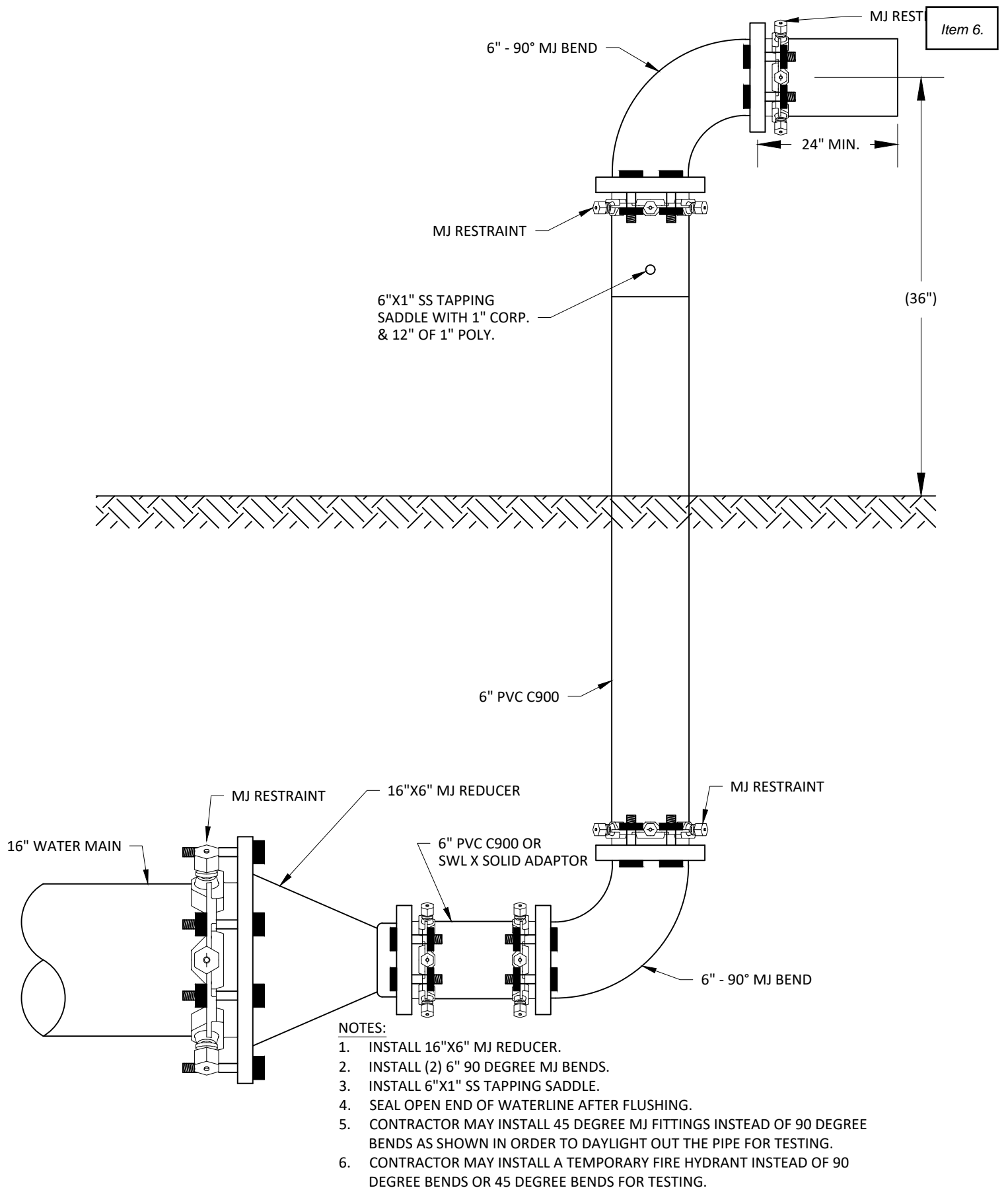
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DRAWING NO. W 22B

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SAMPLING/FLUSHING TAP ON 16" PVC WATERLINES

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

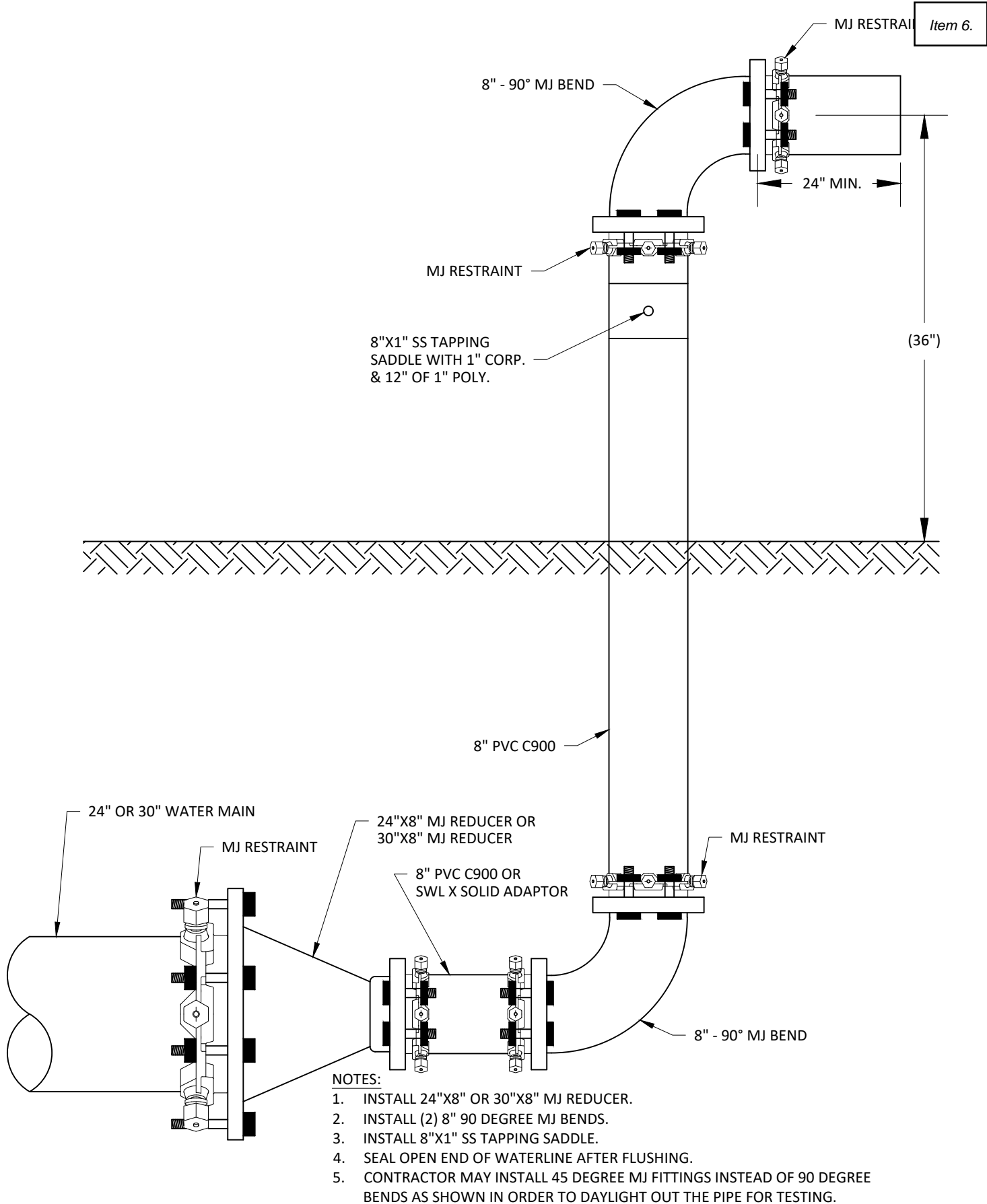
APPROVAL DATE:

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REV. NO. 01

DRAWING NO. W 22C

317



SAMPLING/FLUSHING TAP ON 24"-30" PVC WATERLINES

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

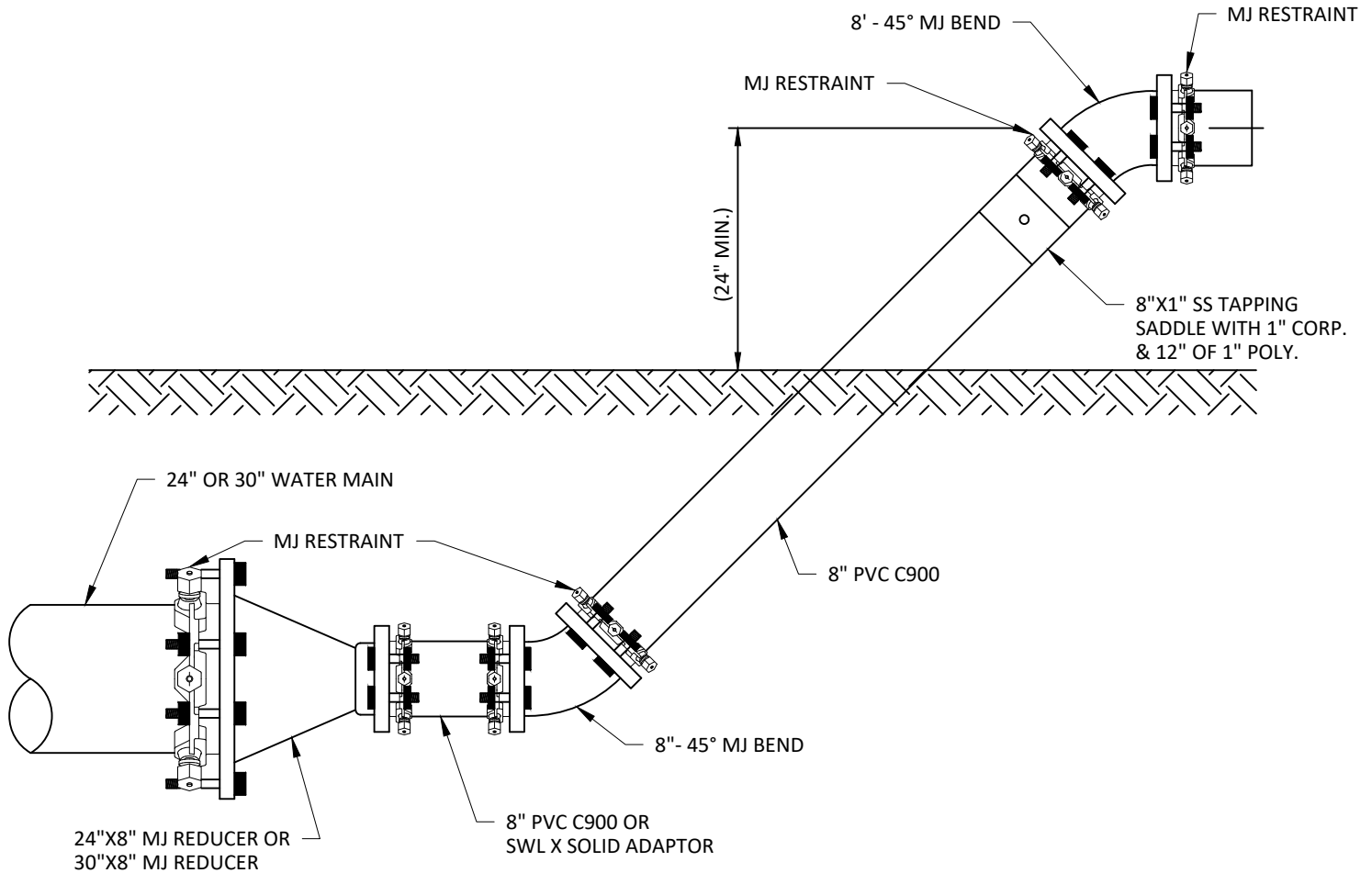
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 22D

318



NOTES:

1. INSTALL 24"X8" OR 30"X8" MJ REDUCER.
2. INSTALL (2) 8" 90 DEGREE MJ BENDS.
3. INSTALL 8"X1" SS TAPPING SADDLE.
4. SEAL OPEN END OF WATERLINE AFTER FLUSHING.

SAMPLING/FLUSHING TAP ON 24"-30" PVC WATERLINES

CITY ENGINEER APPROVAL:

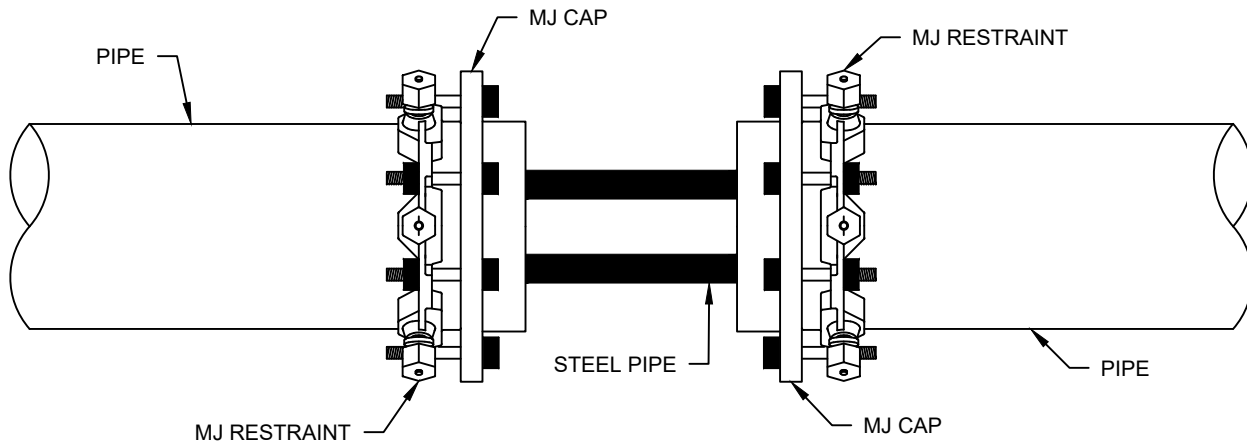
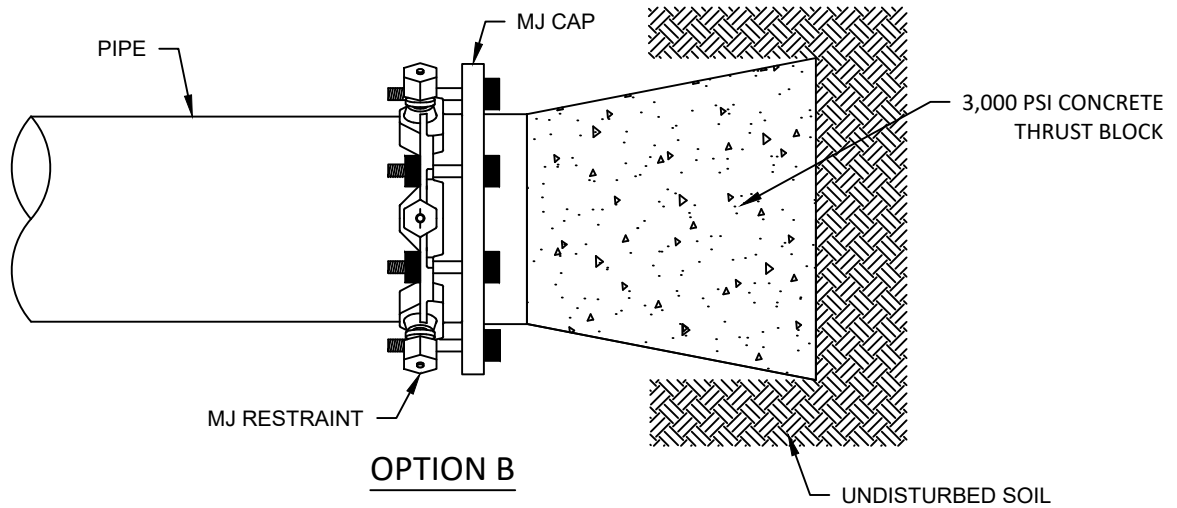
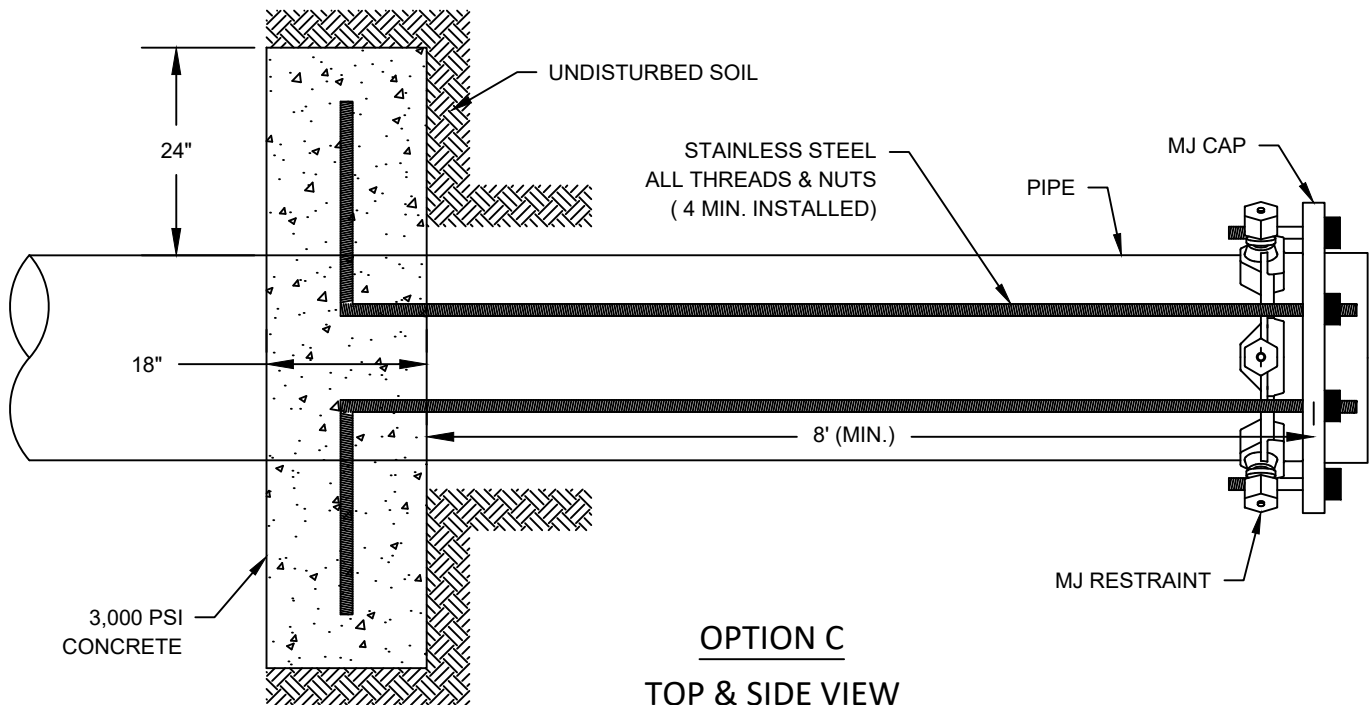
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. W 22E

OPTION AOPTION BOPTION C
TOP & SIDE VIEW

CAPPING OLD WATERLINE WITH MJ CAP

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

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DRAWING NO. W 23

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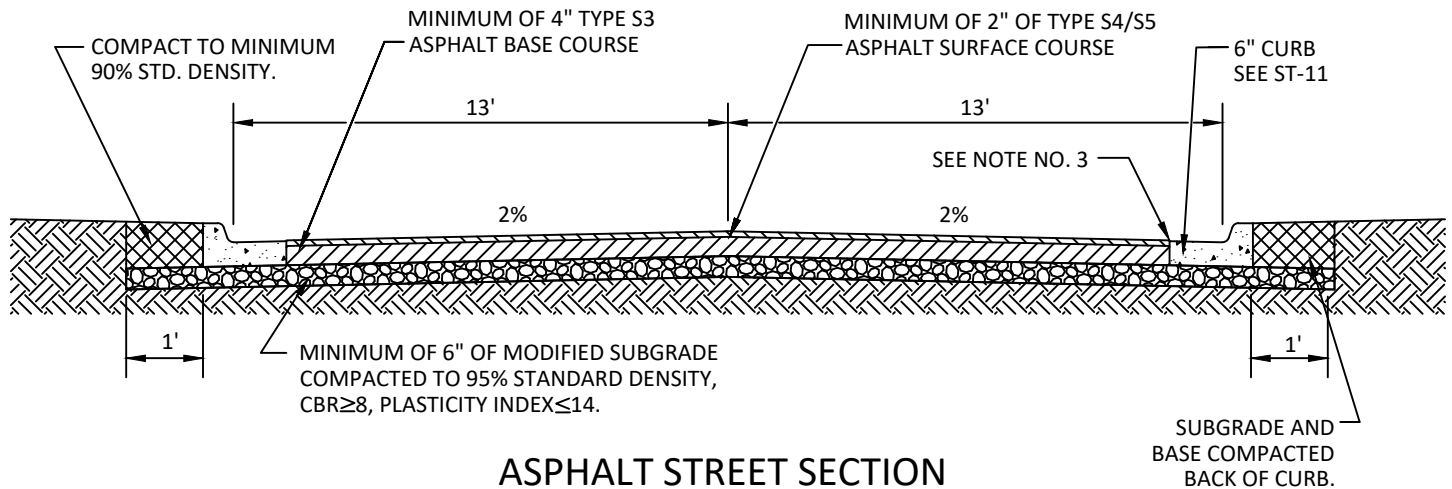
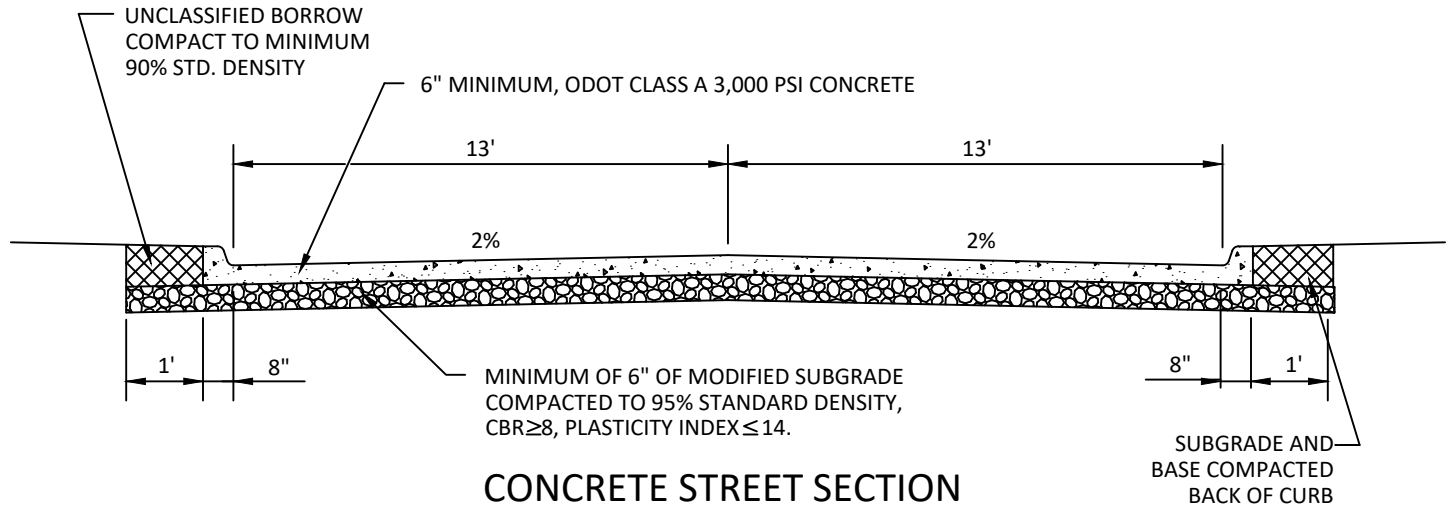
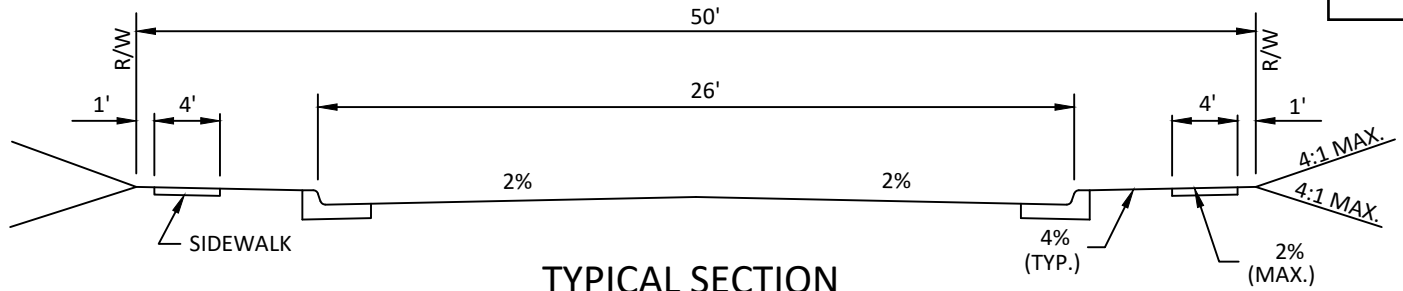
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 00

DRAWING NO. ST 00



NOTES :

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. DOWELS REQUIRED FOR PCC PAVING 8" THICK, OR GREATER, IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 2304.4.A
3. ASPHALT SURFACE SHALL BE $\frac{1}{4}$ " ABOVE EDGE OF CONCRETE GUTTER. THE GUTTER THICKNESS MAY BE REDUCED TO $5\frac{3}{4}$ " TO ACCOMMODATE THIS REQUIREMENT.
4. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.

LOCAL (URBAN) STREET

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

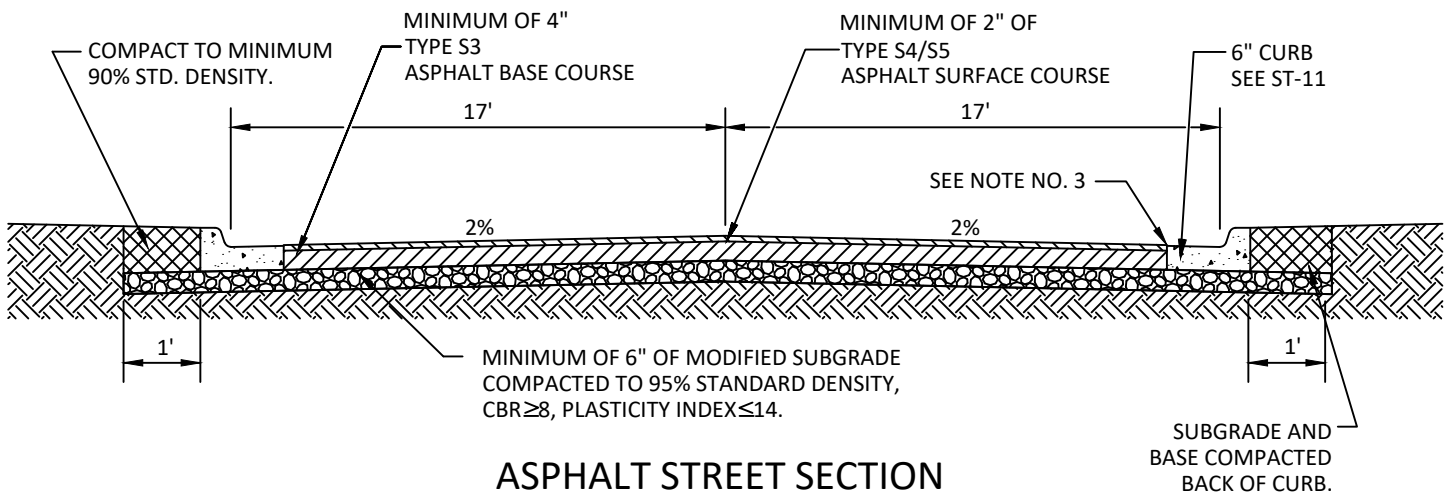
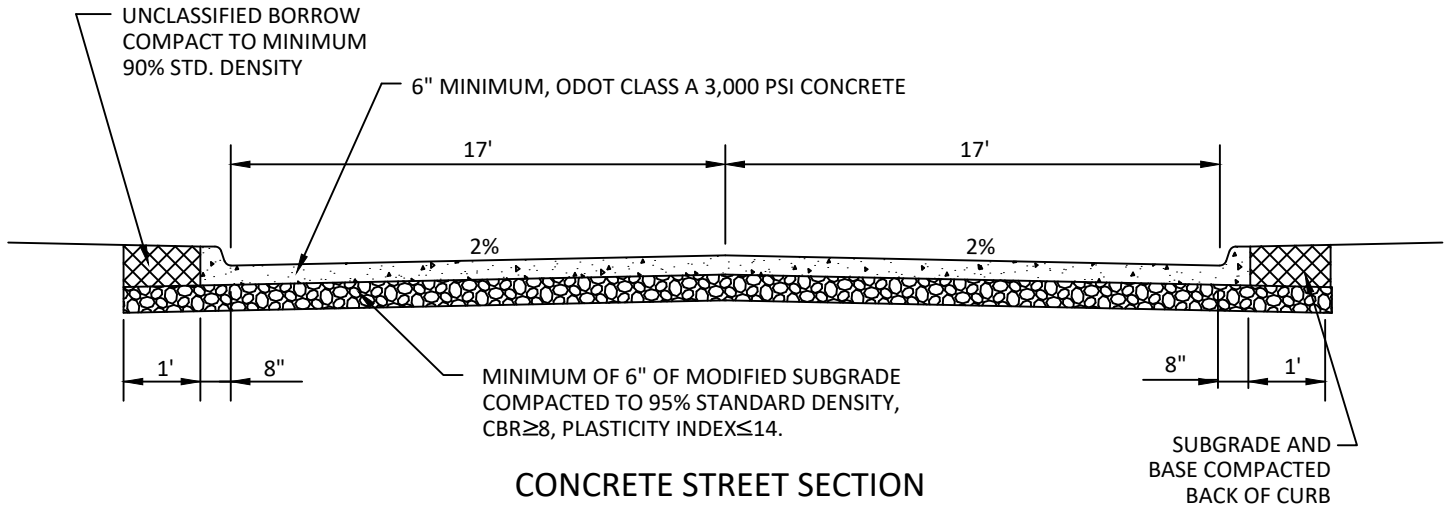
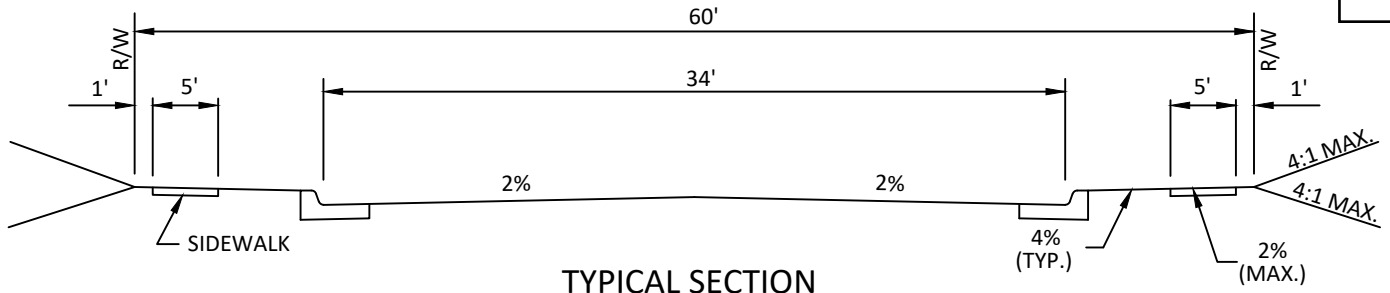
REVISION DATE: 01/2023

REV. NO.

4

DRAWING NO.

ST 01

**NOTES:**

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. DOWELS REQUIRED FOR PCC PAVING 8" THICK, OR GREATER, IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 2304.4.A
3. ASPHALT SURFACE SHALL BE $\frac{1}{4}$ " ABOVE EDGE OF CONCRETE GUTTER. THE GUTTER THICKNESS MAY BE REDUCED TO $5\frac{3}{4}$ " TO ACCOMMODATE THIS REQUIREMENT.
4. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.

COLLECTOR (URBAN) STREET

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

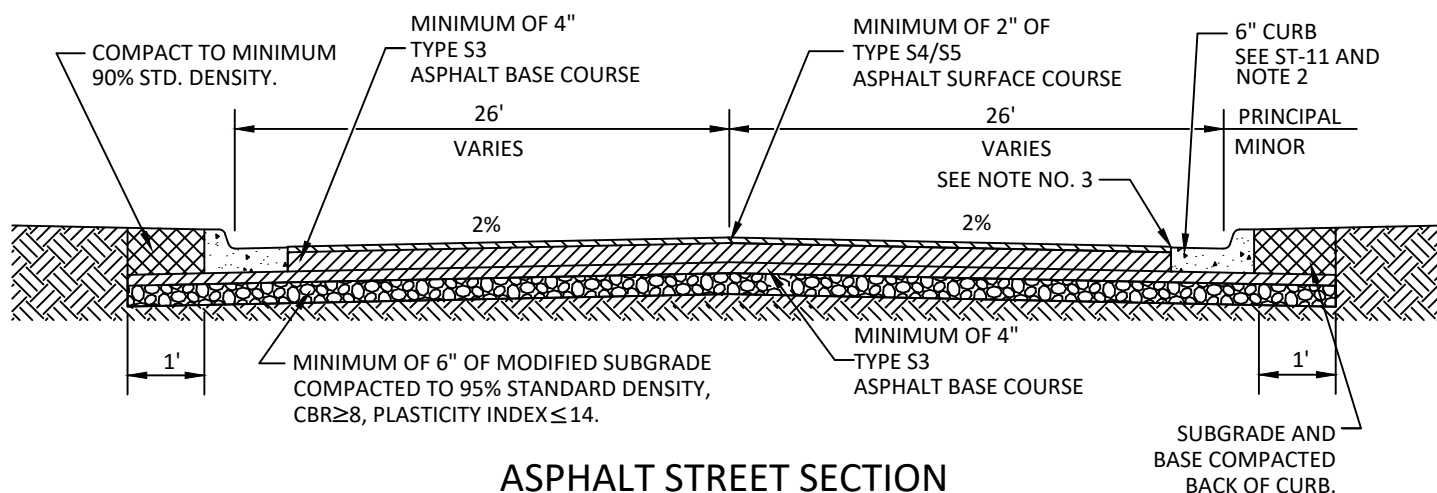
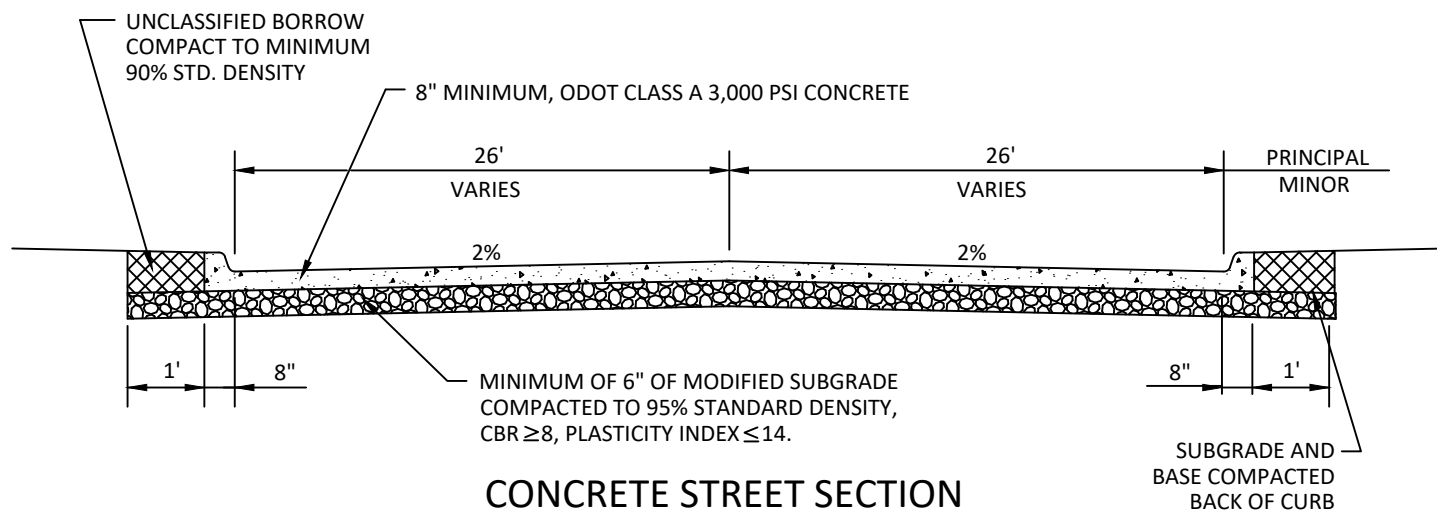
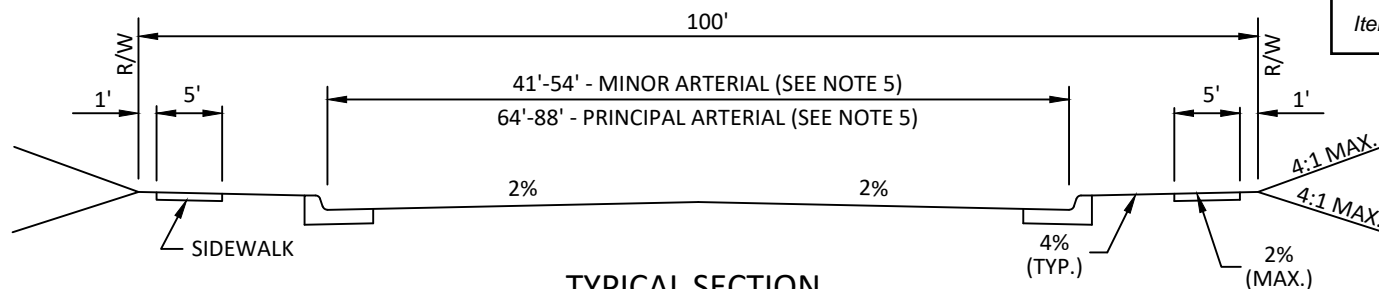
REVISION DATE: 01/2023

REV. NO.

4

DRAWING NO.

ST 02



NOTES :

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. DOWELS REQUIRED FOR PCC PAVING 8" THICK, OR GREATER, IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 2304.4.A
3. ASPHALT SURFACE SHALL BE $\frac{1}{4}$ " ABOVE EDGE OF CONCRETE GUTTER. THE GUTTER THICKNESS MAY BE REDUCED TO $5\frac{3}{4}$ " TO ACCOMMODATE THIS REQUIREMENT.
4. PAVEMENT SECTION TO BE SUPER-ELEVATED AT ROADWAY CURVES.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.

ARTERIAL (URBAN) STREET

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO.

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DRAWING NO.

ST 03

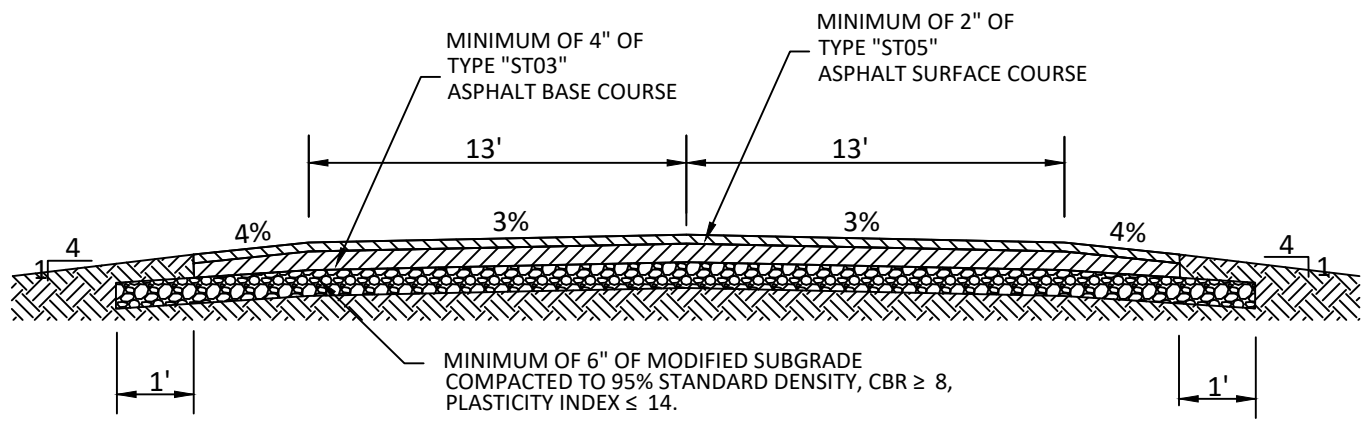
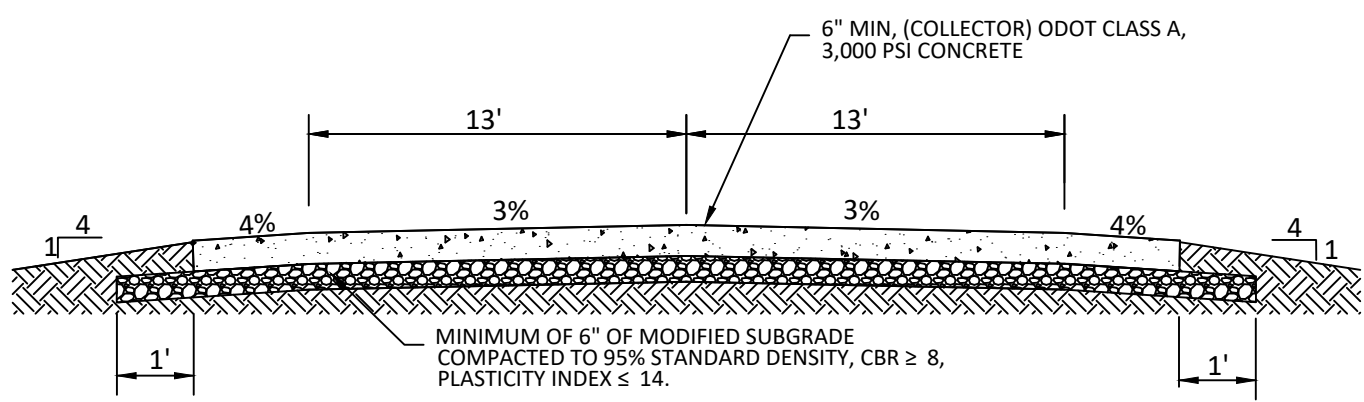
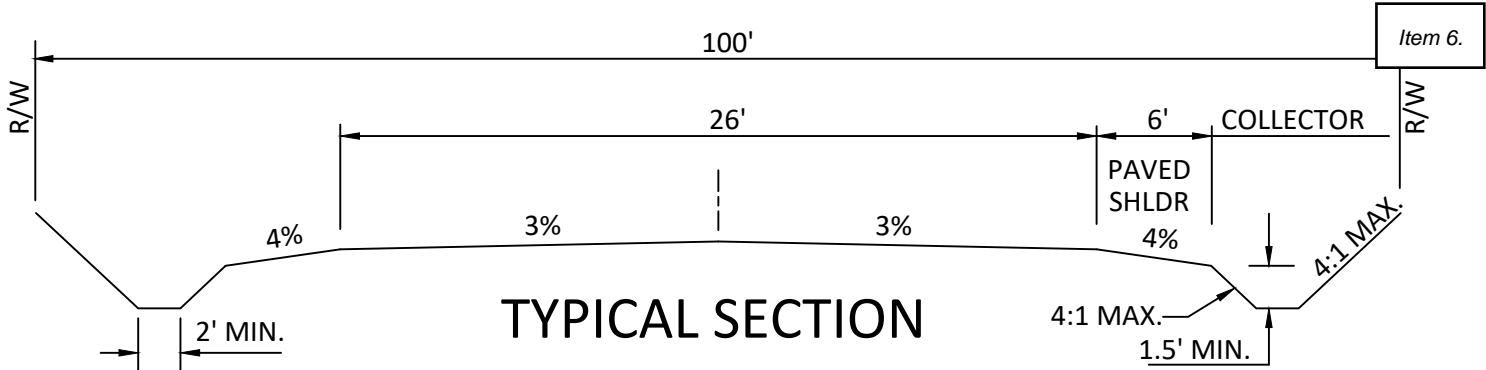


1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. ASPHALT SURFACE SHALL BE 1/4" ABOVE EDGE OF CONCRETE GUTTER. THE GUTTER THICKNESS MAY BE REDUCED TO 5 3/4" TO ACCOMMODATE THIS REQUIREMENT.
3. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.
4. TYPICAL SECTIONS ILLUSTRATE BOTH THE CURB AND GUTTER AND DITCH SECTIONS WITH CONDITIONS USED TO BE DETERMINED BY THE CLASSIFICATION OF ROADWAY DEFINED IN THE COMPREHENSIVE TRANSPORTATION PLAN.

RESIDENTIAL ESTATE/LOCAL (RURAL) ROAD

CITY OF NORMAN, OKLAHOMA

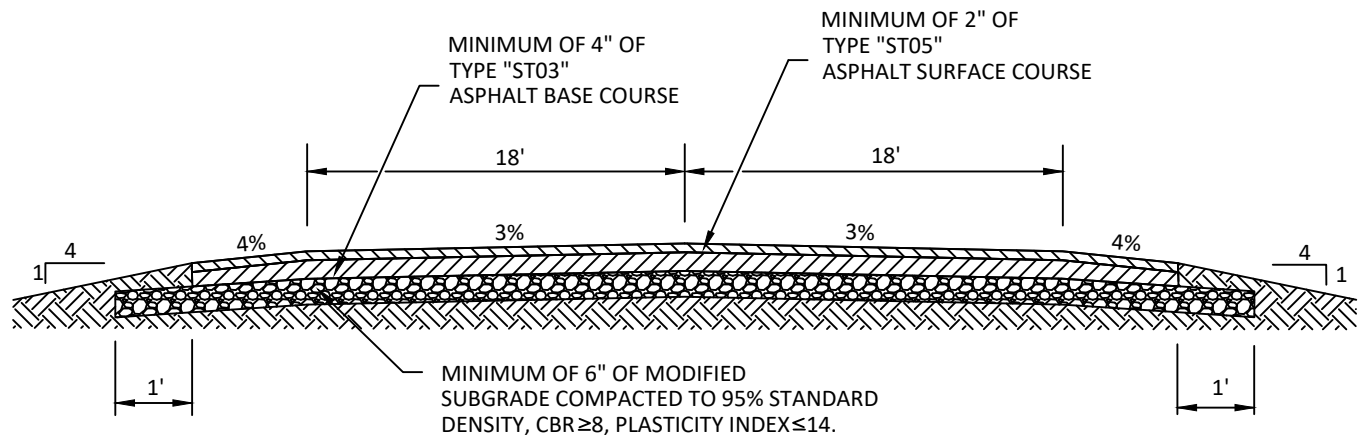
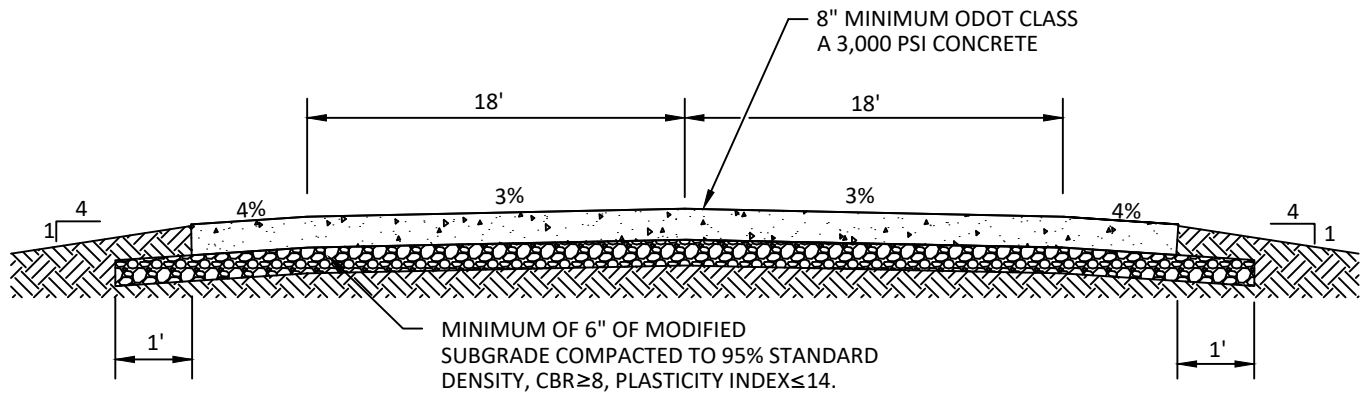
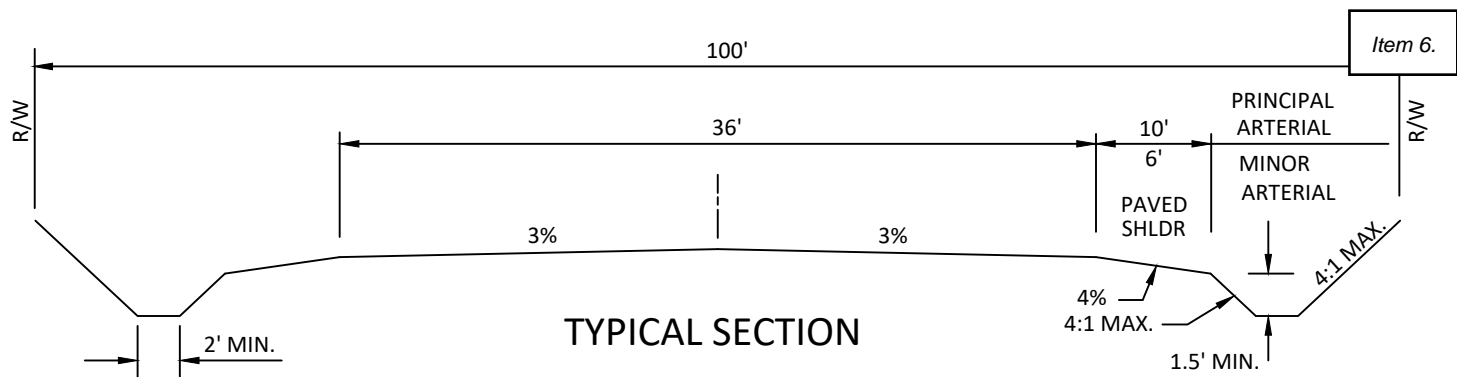
DRAWING NO. ST 04



- NOTES:**
- PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
 - REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.

COLLECTOR (RURAL) ROAD

CITY ENGINEER APPROVAL:		CITY OF NORMAN, OKLAHOMA		
APPROVAL DATE:	REVISION DATE: 01/2023	REV. NO. 04	DRAWING NO. ST 05	326



NOTES:

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. DOWELS REQUIRED FOR PCC PAVING 8" THICK, OR GREATER, IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 2304.4.A.
3. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.

ARTERIAL (RURAL) ROAD

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

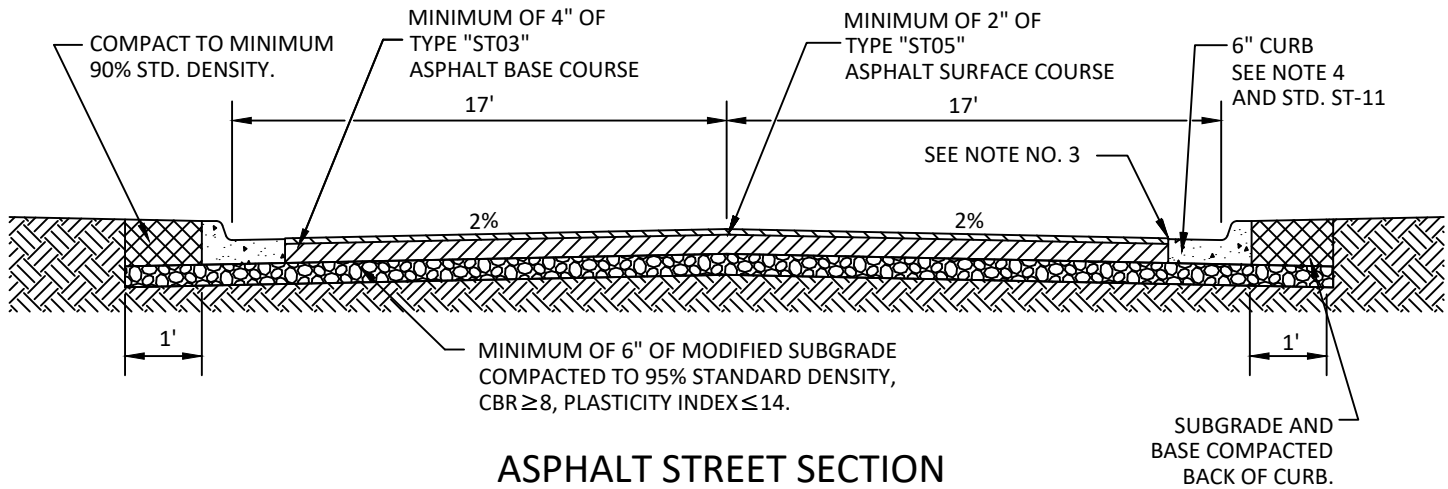
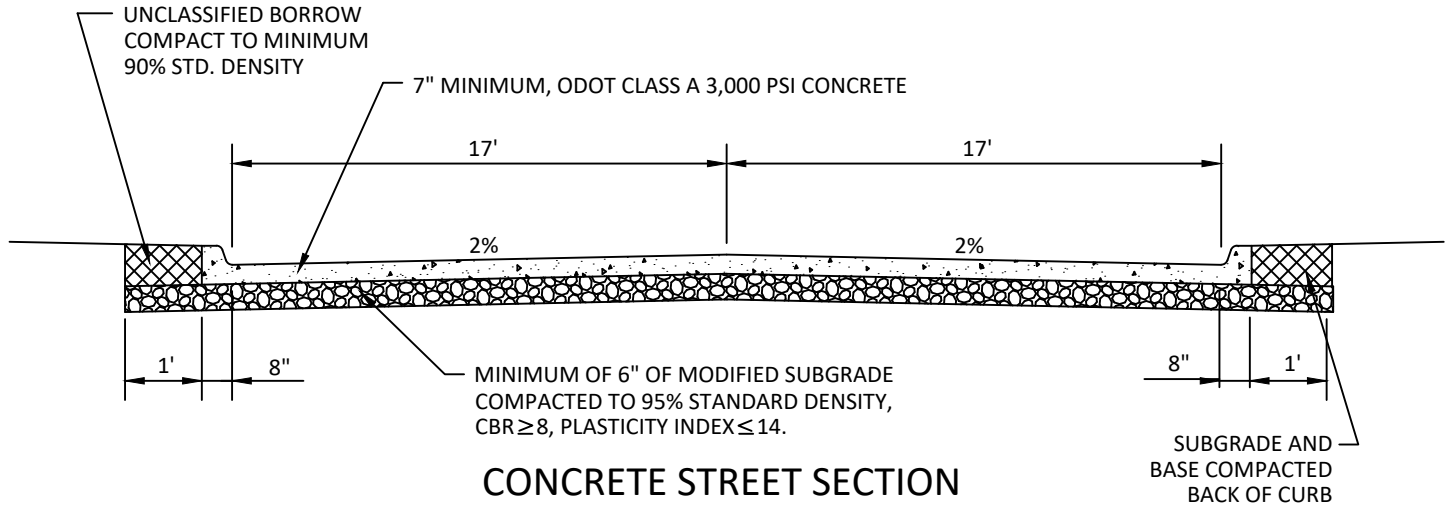
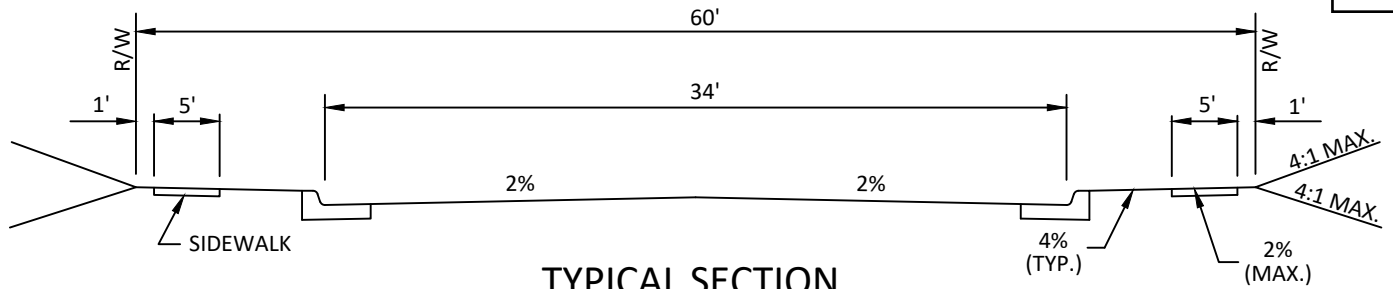
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 03

DRAWING NO. ST 06A

327



NOTES:

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. STREET PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. DOWELS REQUIRED FOR PCC PAVING 8" THICK, OR GREATER, IN ACCORDANCE WITH STANDARD SPECIFICATIONS SECTION 2304.4.A
3. ASPHALT SURFACE SHALL BE $\frac{1}{4}$ " ABOVE EDGE OF CONCRETE GUTTER. THE GUTTER THICKNESS MAY BE REDUCED TO $5\frac{3}{4}$ " TO ACCOMMODATE THIS REQUIREMENT.
4. CURB THICKNESS TO BE 8" THICK, OR 2" THICK TYPE "ST03" ASPHALT LAYER EXTENDED UNDER CURB SECTION.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND SECTION REQUIREMENTS.

INDUSTRIAL / COMMERCIAL STREET

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

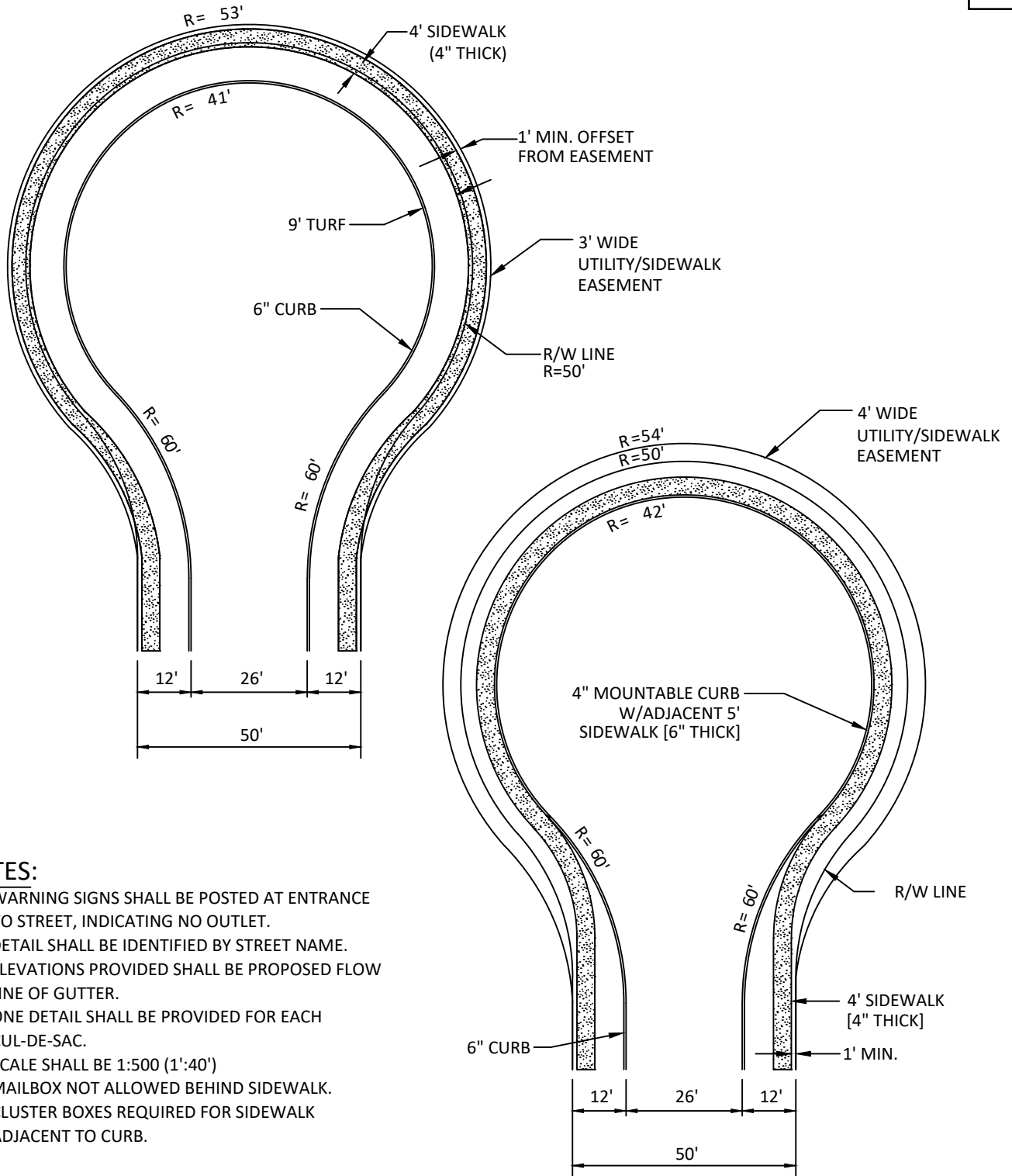
REVISION DATE: 01/2023

REV. NO.

2

DRAWING NO.

ST 60B

**NOTES:**

1. WARNING SIGNS SHALL BE POSTED AT ENTRANCE TO STREET, INDICATING NO OUTLET.
2. DETAIL SHALL BE IDENTIFIED BY STREET NAME.
3. ELEVATIONS PROVIDED SHALL BE PROPOSED FLOW LINE OF GUTTER.
4. ONE DETAIL SHALL BE PROVIDED FOR EACH CUL-DE-SAC.
5. SCALE SHALL BE 1:500 (1':40')
6. MAILBOX NOT ALLOWED BEHIND SIDEWALK. CLUSTER BOXES REQUIRED FOR SIDEWALK ADJACENT TO CURB.

RESIDENTIAL CUL-DE-SAC (NO ISLAND)

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

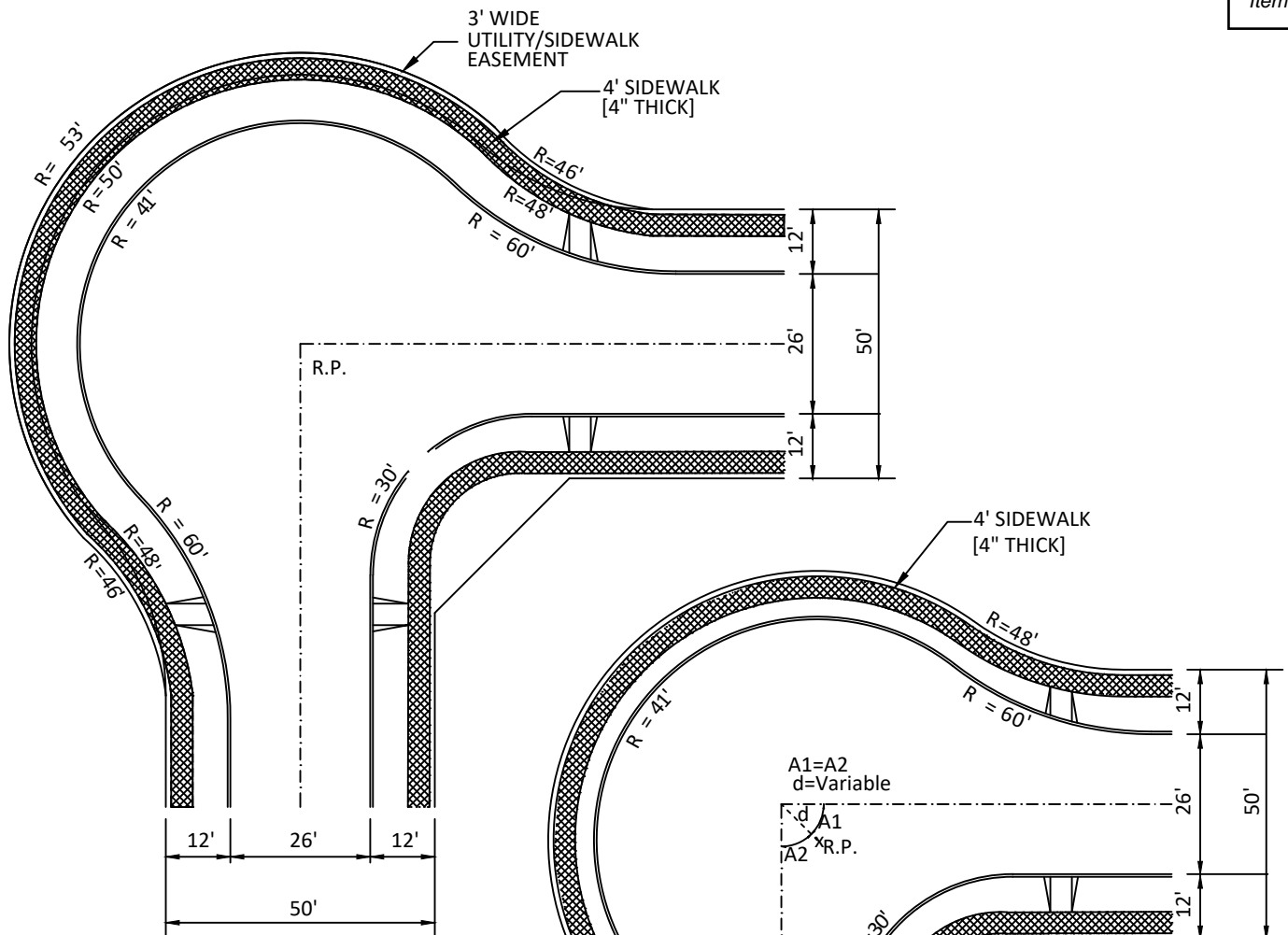
REVISION DATE: 01/2023

REV. NO.

3

DRAWING NO.

ST 07A



ELBOW

ELBOW WITH
R.P. OFFSET**NOTES:**

1. DISTANCE "d" : 10 FOOT MAXIMUM.
2. DETAIL SHALL BE IDENTIFIED BY STREET NAME.
3. ELEVATIONS PROVIDED SHALL BE PROPOSED FLOW LINE OF GUTTER.
4. ONE DETAIL SHALL BE PROVIDED FOR EACH RESIDENTIAL ELBOW.
5. SCALE SHALL BE 1:500 (1':40')
6. MAILBOX NOT ALLOWED BEHIND SIDEWALK. CLUSTER BOXES REQUIRED FOR SIDEWALK ADJACENT TO CURB.

RESIDENTIAL ELBOW (NO ISLAND)

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 2

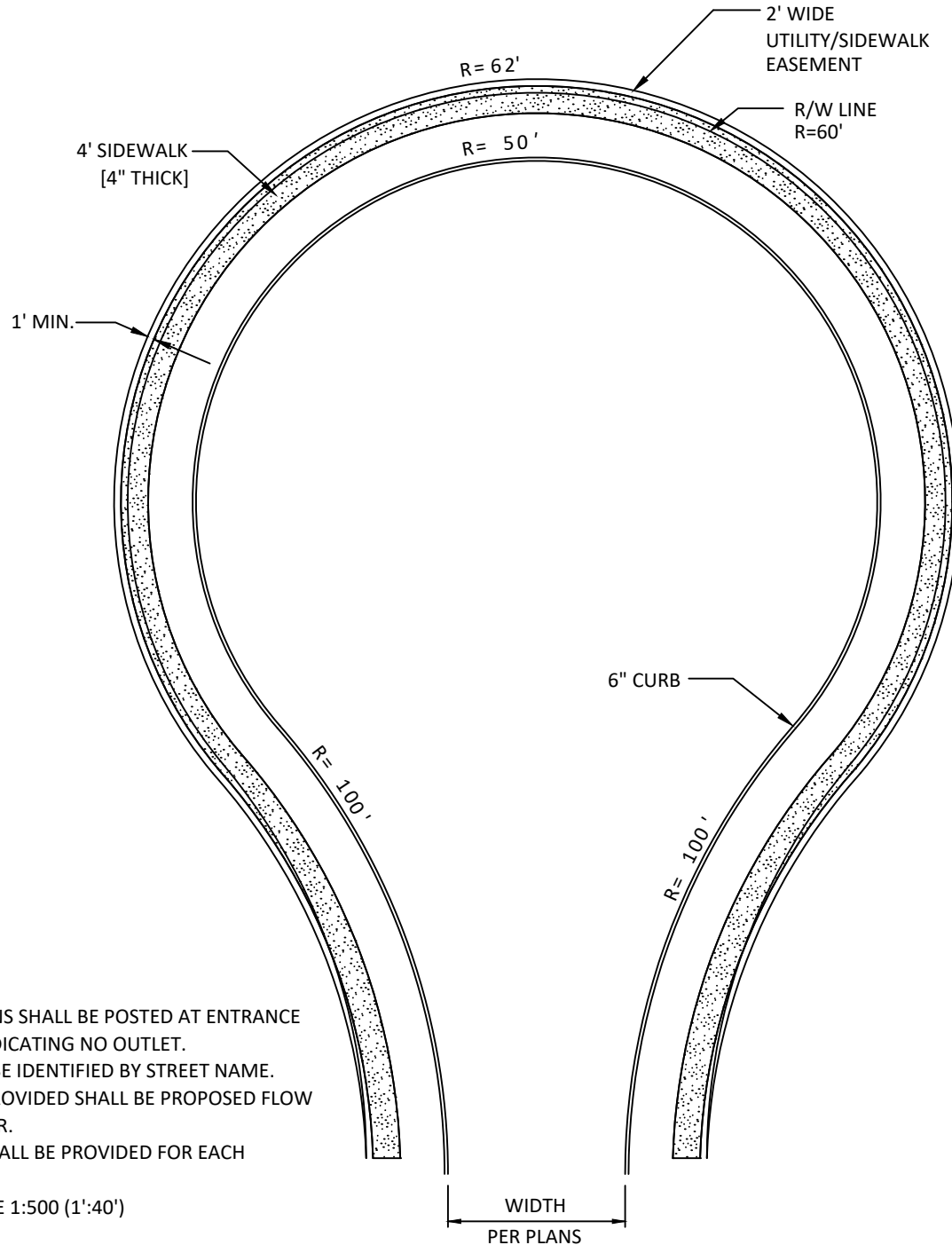
DRAWING NO. ST 07B



- ## RESIDENTIAL CUL-DE-SAC (WITH ISLAND)

CITY OF NORMAN, OKLAHOMA

DRAWING NO. ST 08

**NOTES:**

1. WARNING SIGNS SHALL BE POSTED AT ENTRANCE TO STREET, INDICATING NO OUTLET.
2. DETAIL SHALL BE IDENTIFIED BY STREET NAME.
3. ELEVATIONS PROVIDED SHALL BE PROPOSED FLOW LINE OF GUTTER.
4. ONE DETAIL SHALL BE PROVIDED FOR EACH CUL-DE-SAC.
5. SCALE SHALL BE 1:500 (1':40')

NON-RESIDENTIAL CUL-DE-SAC

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO.

1

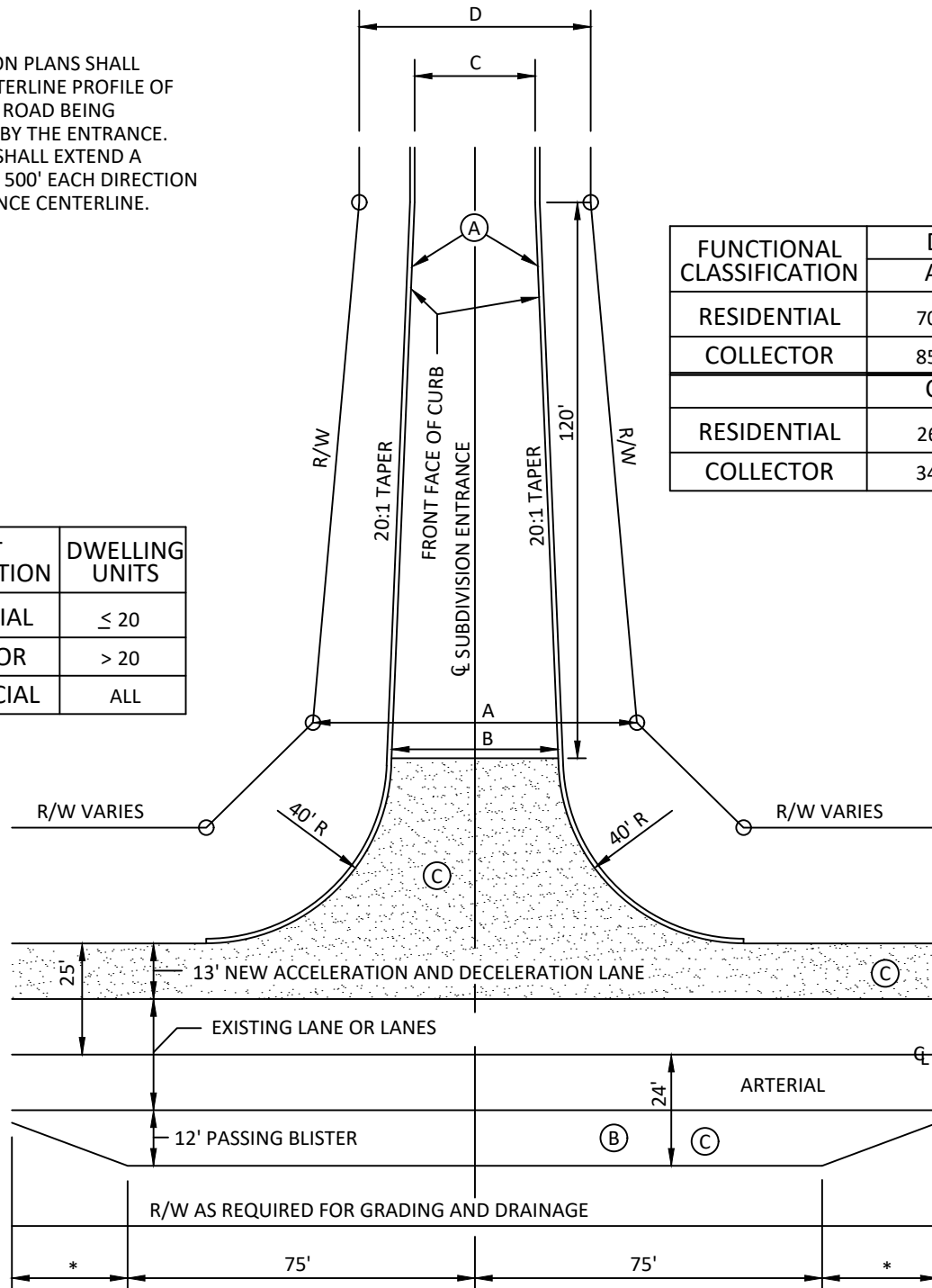
DRAWING NO.

ST 09

CONSTRUCTION PLANS SHALL INCLUDE CENTERLINE PROFILE OF THE EXISTING ROAD BEING INTERSECTED BY THE ENTRANCE. THE PROFILE SHALL EXTEND A MINIMUM OF 500' EACH DIRECTION FROM ENTRANCE CENTERLINE.

STREET CLASSIFICATION	DWELLING UNITS
RESIDENTIAL	≤ 20
COLLECTOR	> 20
COMMERCIAL	ALL

FUNCTIONAL CLASSIFICATION	DIMENSION	
	A	B
RESIDENTIAL	70'	38'
COLLECTOR	85'	46'
	C	D
RESIDENTIAL	26'	50'
COLLECTOR	34'	60'



- (A) STANDARD CURB & GUTTER
- (B) PASSING BLISTER WHEN REQUIRED BY CITY ENGINEER
- (C) LANE WIDENING SHALL MATCH EXISTING PAVEMENT SURFACE TYPE

* 150' ARTERIAL
* 100' COLLECTOR

RESIDENTIAL/ARTERIAL STREET INTERSECTION

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

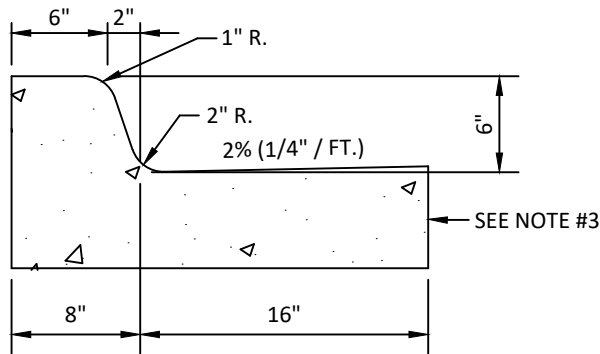
REVISION DATE: 01/2023

REV. NO.

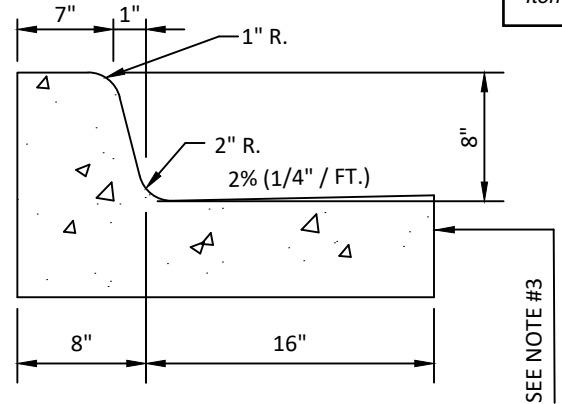
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DRAWING NO.

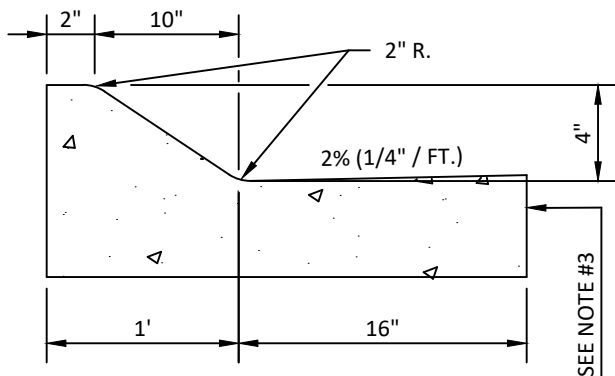
ST 10



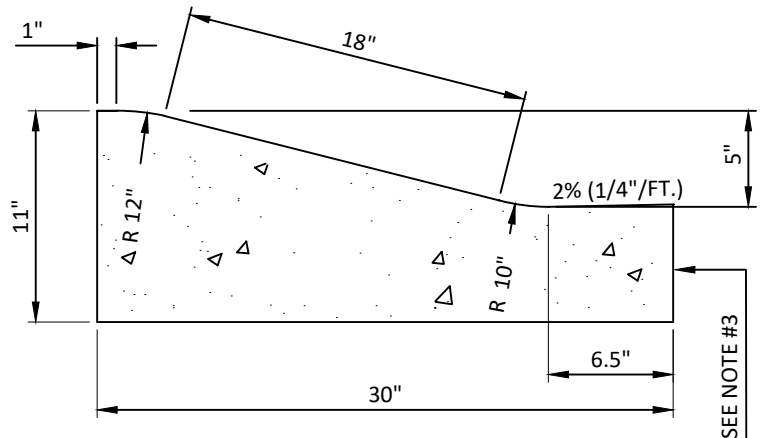
150 (6'') BARRIER CURB & GUTTER



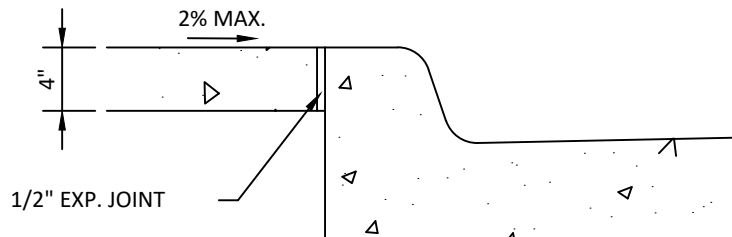
200 (8'') BARRIER CURB & GUTTER



100 (4'') MOUNTABLE CURB & GUTTER



125 (5'') MOUNTABLE CURB & GUTTER



SIDEWALK ADJACENT TO CURB

NOTES:

1. SEE ODOT STANDARD CSCD FOR JOINT DETAILS.
2. #4 TIE BARS 750 2'-6" LONG REQUIRED AT 18" CENTERS WITH TONGUE AND GROOVE JOINT IF CURB AND GUTTER NOT CAST INTEGRALLY WITH STREET PAVING. LONGITUDINAL CONSTRUCTION JOINTS ON LOCAL AND COLLECTOR STREET MAY, AT THE OPTION OF THE DESIGN ENGINEER, BE BUTT TYPE JOINTS WITH TIEBARS OR KEYWAY TYPE JOINT WITHOUT TIEBARS.
3. 150 (6'') MIN. WHEN CURB & GUTTER IS POURED SEPARATELY IF CURB & GUTTER IS POURED MONOLITHICALLY WITH THE CONCRETE STREET PAVEMENT, THE GUTTER THICKNESS SHALL BE SAME AS THE APPROVED CONCRETE STREET PAVEMENT THICKNESS. USE 1/2" DIA. DOWELS 18" LONG AT 24" CENTERS (SMOOTH OR DEFORMED) TO TIE CURB TO CONCRETE STREET PAVEMENT.
4. FOR ARTERIAL (URBAN) STREET SECTIONS, THE GUTTER CROSS-SLOPE SHALL BE 3%.

CURB AND GUTTER

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

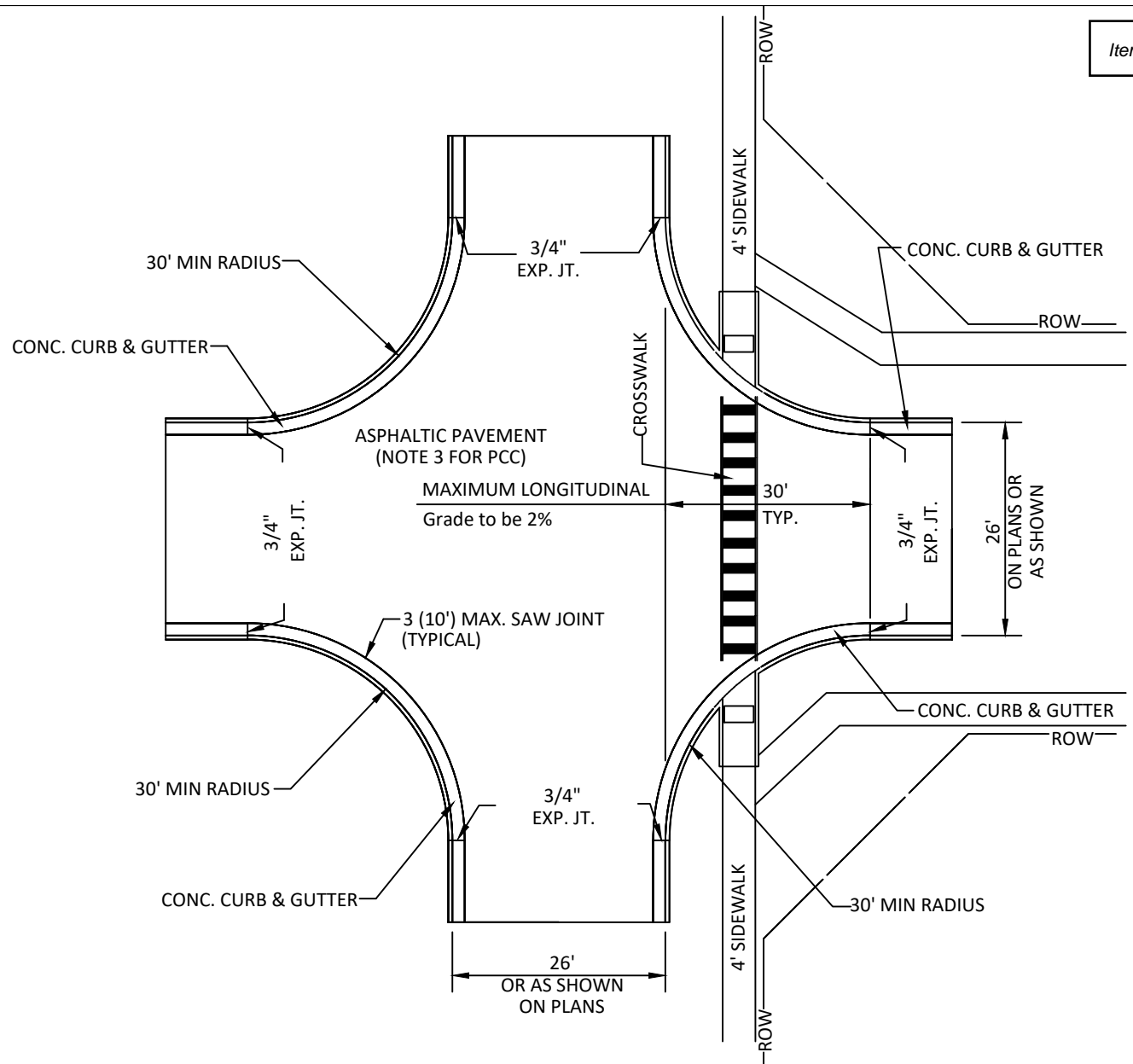
REVISION DATE: 01/2023

REV. NO.

4

DRAWING NO.

ST 11

**NOTES:**

1. SIDEWALKS TO BE LOCATED PER THE LAND SUBDIVISION CODE.
2. WHEELCHAIR RAMP PER STANDARD ST-14.
3. FOR PCC PAVING, JOINT LAYOUT TO BE SUBMITTED FOR REVIEW BY CITY ENGINEER.
4. SIDEWALKS TO BE LOCATED PER ST-01.

RESIDENTIAL STREET INTERSECTION LAYOUT

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

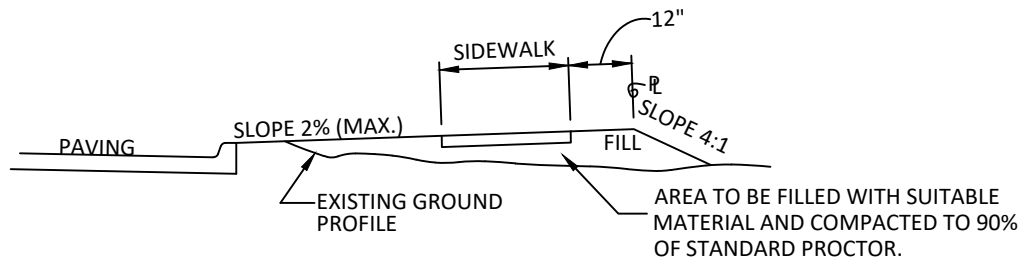
REVISION DATE: **01/2023**

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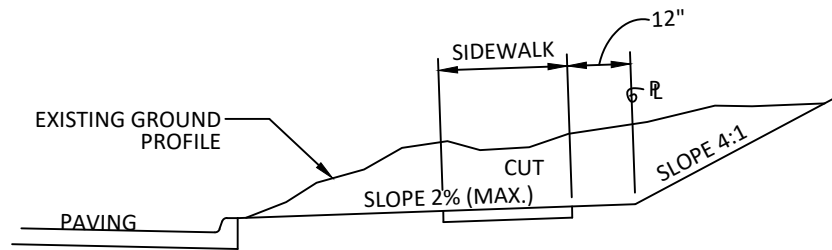
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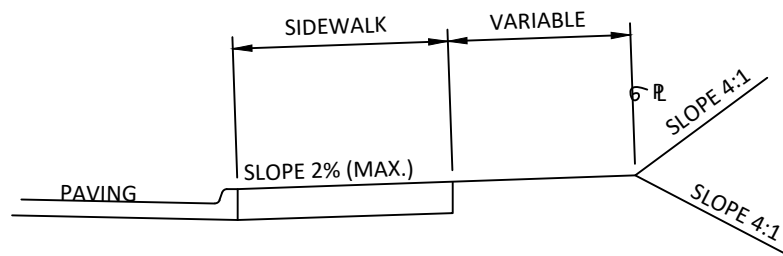
ST 12



FILL SECTION



CUT SECTION



RAMP TYPE

TO BE USED WITH LESS THAN 12' FACE OF CURB TO LP OR PLAT WHICH SPECIFIES RAMP DRIVES.

NOTES:

1. ENTIRE AREA BETWEEN CURB AND PROPERTY LINE TO BE GRADED AS SHOWN.
2. MINIMUM SIDEWALK THICKNESS 4".
3. MINIMUM THICKNESS THROUGH DRIVE 6".
4. INSTALL 1/2" EXPANSION JOINTS BETWEEN SIDEWALK AND CURB.

RIGHT-OF-WAY GRADING

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

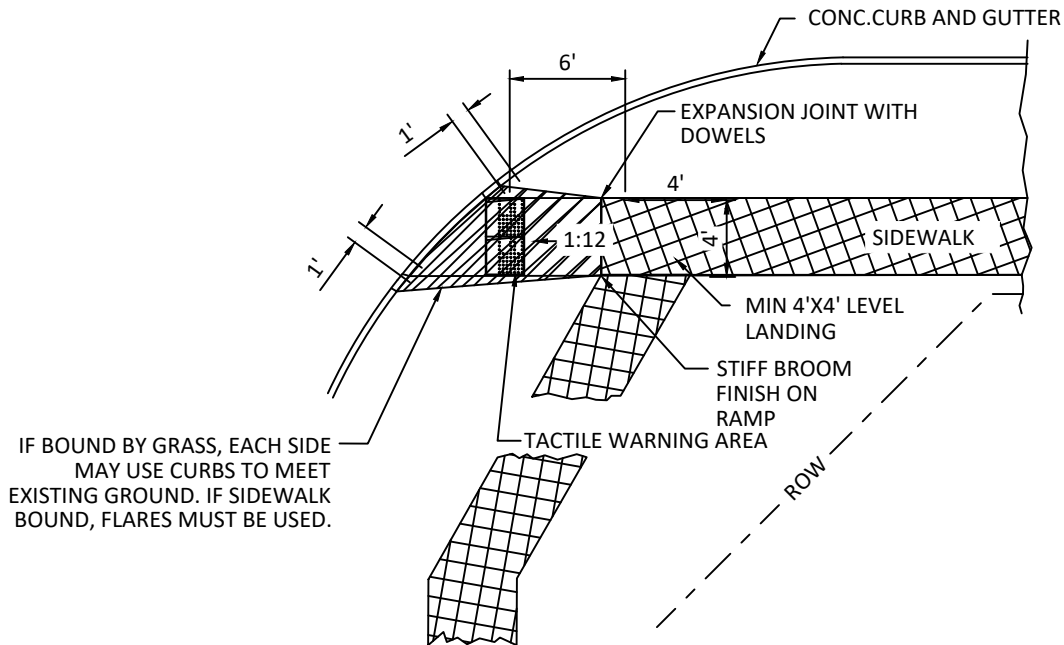
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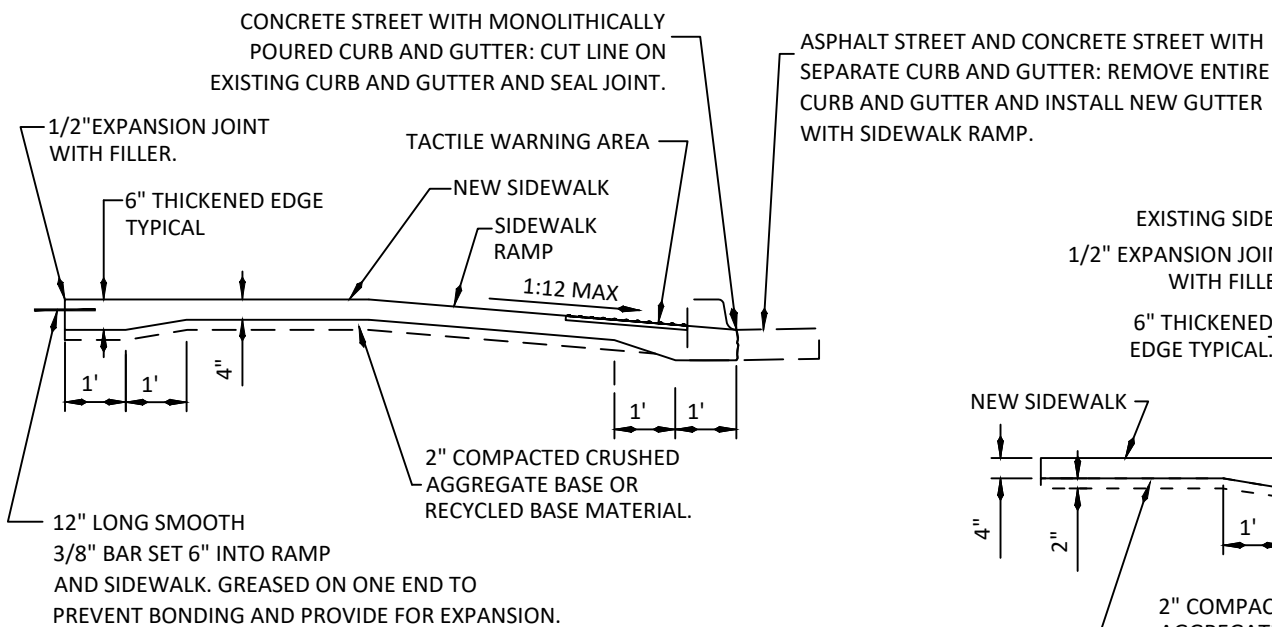
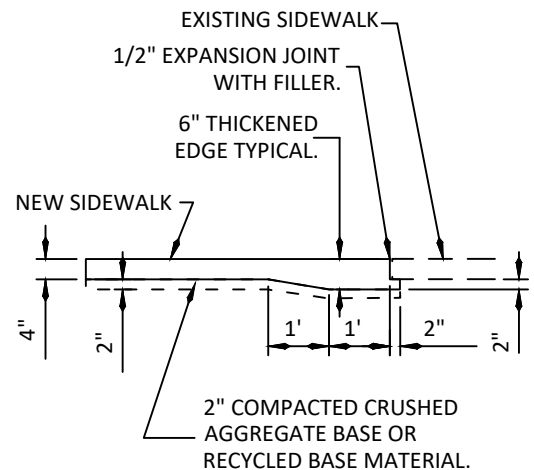
1

DRAWING NO.

ST 13



SINGLE APPROACH CORNER RAMP

PROFILE OF SIDEWALK
AT RAMPPROFILE DETAIL OF
SIDEWALK CONNECTIONS

NOTES:

1. CROSS SLOPE OF LANDING AREA SHALL NOT EXCEED 2% IN ANY DIRECTION.
2. 6" THICKENING AND 3/8" SMOOTH DOWEL AND SHALL BE USED TO CONNECT NEW SIDEWALK TO EXISTING DRIVEWAY.
3. ALL SIDEWALKS AND PEDESTRIAN RAMPS SHALL BE COMPLIANT WITH THE MOST CURRENT VERSION OF THE ADA STANDARDS AND THE PUBLIC RIGHTS OF WAY ACCESSIBILITY GUIDELINES (PROWAG).
4. FOR ADDITIONAL RAMP CONFIGURATIONS, SEE THE CURRENT VERSION OF THE ODOT WHEEL CHAIR RAMP DETAILS WCR-3)

SIDEWALK DETAILS & WHEELCHAIR RAMP

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

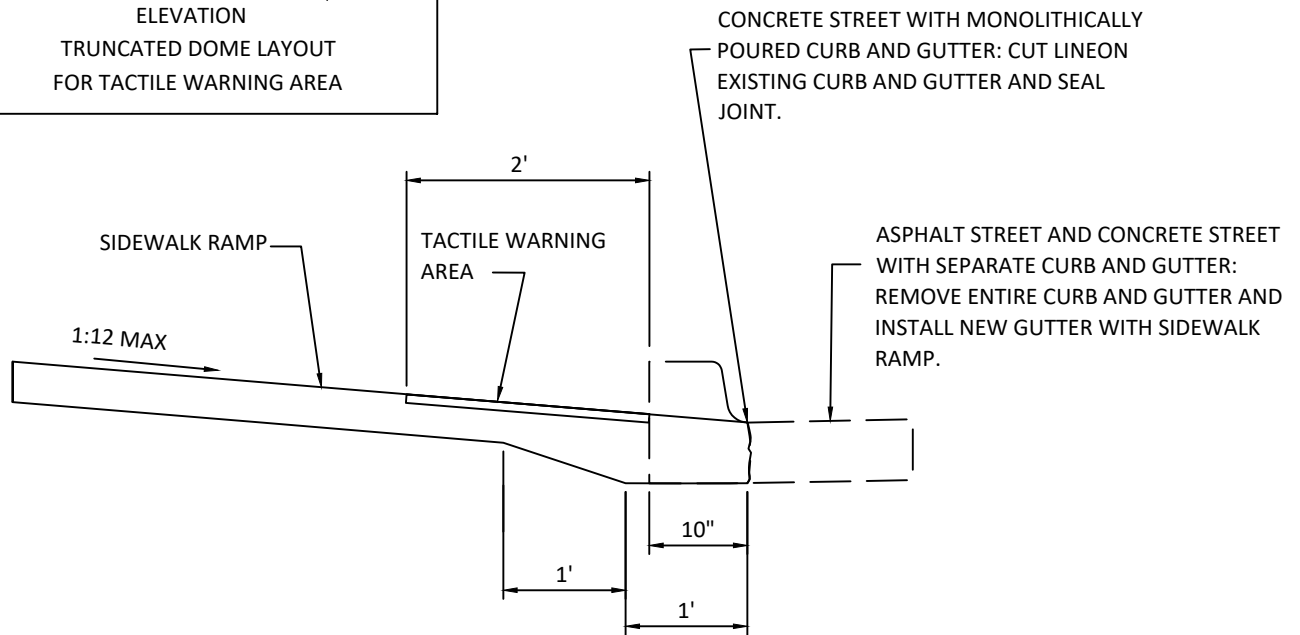
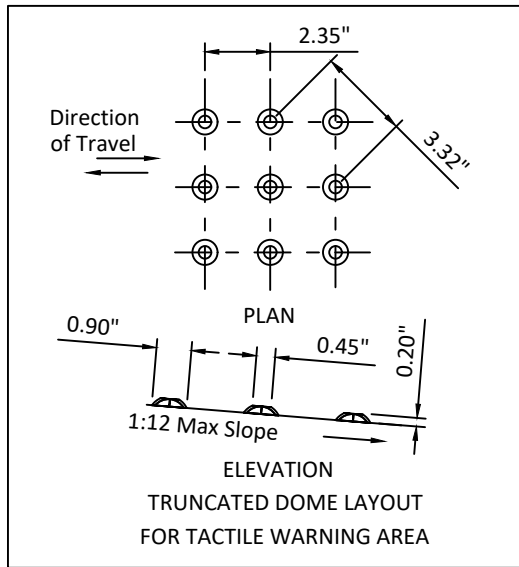
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5

DRAWING NO.

ST 14

337



PROFILE OF SIDEWALK AT RAMP

NOTES:

1. TRUNCATED DOMES OF TACTILE WARNING AREA SHALL MEET SPECIFICATIONS AND TOLERANCES OF ADA ACT 4.29.2.
2. ALL SIDEWALKS AND PEDESTRIAN RAMPS SHALL BE COMPLIANT WITH THE MOST CURRENT VERSION OF THE ADA STANDARDS AND THE PUBLIC RIGHTS OF WAY ACCESSIBILITY GUIDELINES (PROWAG).

RAMP DETAILS

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

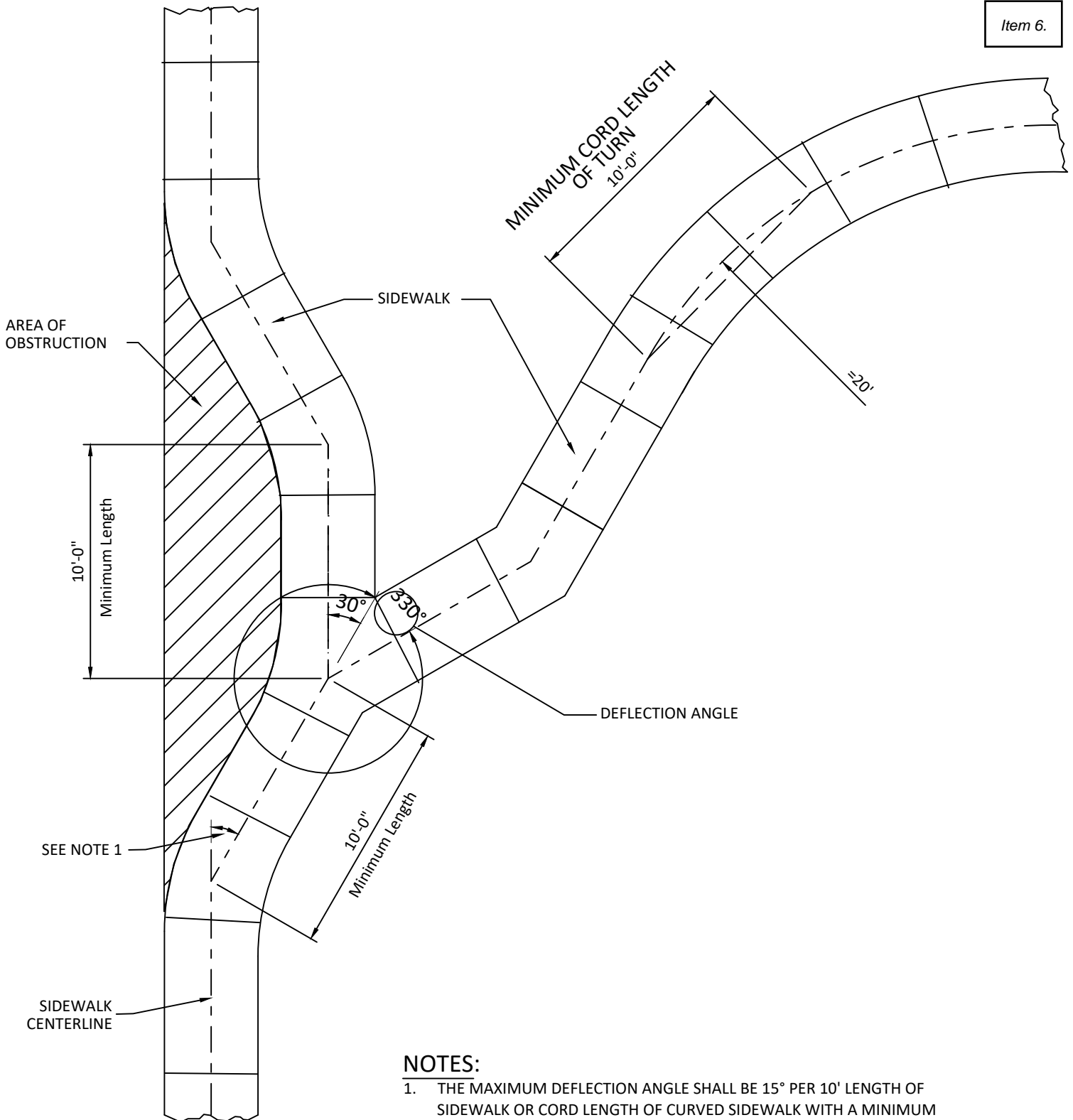
REVISION DATE: 01/2023

REV. NO.

1

DRAWING NO.

ST 14a

**NOTES:**

1. THE MAXIMUM DEFLECTION ANGLE SHALL BE 15° PER 10' LENGTH OF SIDEWALK OR CORD LENGTH OF CURVED SIDEWALK WITH A MINIMUM 20' RADIUS.
2. SIDEWALK CROSS SLOPE SHALL NOT EXCEED 2%
3. SIDEWALK SHALL NOT CROSS THE CENTER LINE OF IT'S SELF EITHER DIRECTION FROM CENTER LINE, UNLESS IT IS NECESSARY TO AVOID OBSTACLES SUCH AS TREES OR FIRE HYDRANTS, ETC.

SIDEWALK HORIZONTAL ALIGNMENT DETAILS

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

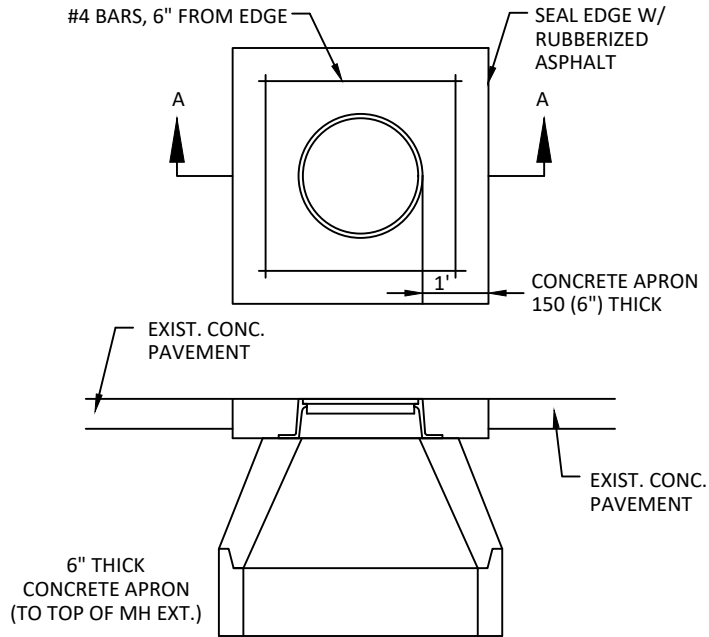
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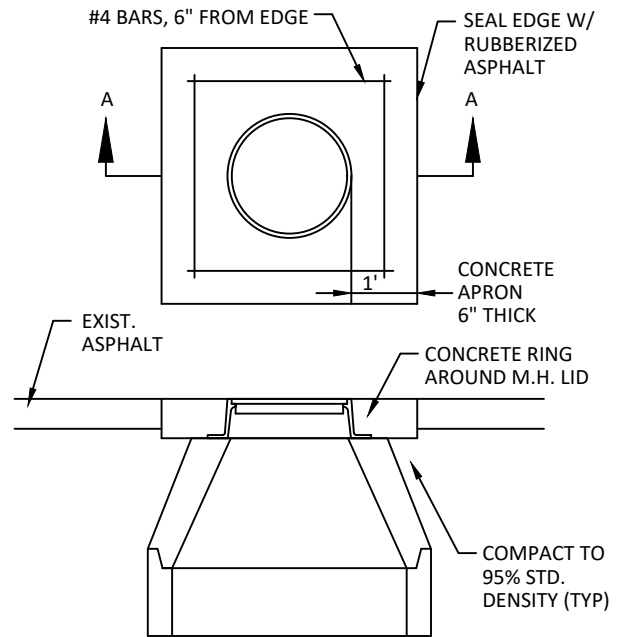
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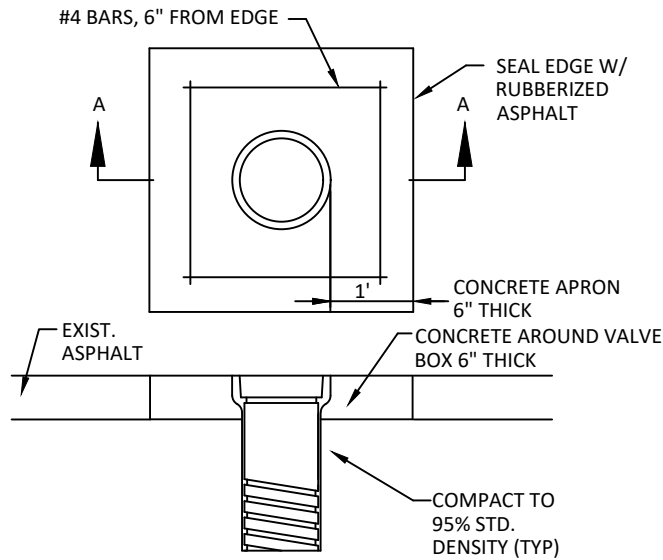
ST 14B



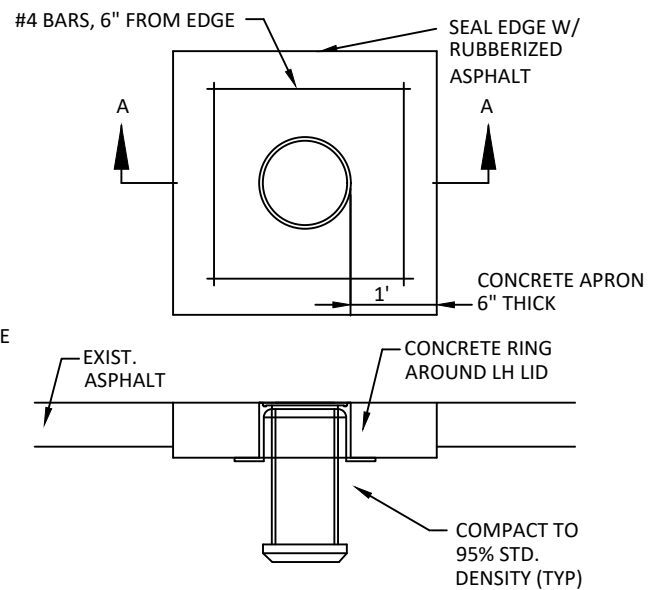
SECTION "A" MANHOLE IN
CONCRETE, ADJUST TO
GRADE



SECTION "A" MANHOLE IN
ASPHALT, ADJUST TO
GRADE



SECTION "A" WATER VALVE
TO GRADE IN ASPHALT



SECTION "A" LAMPHOLE IN
ASPHALT ADJUST TO
GRADE

MANHOLES, LAMPHOLES, AND VALVE BOXES IN STREETS

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

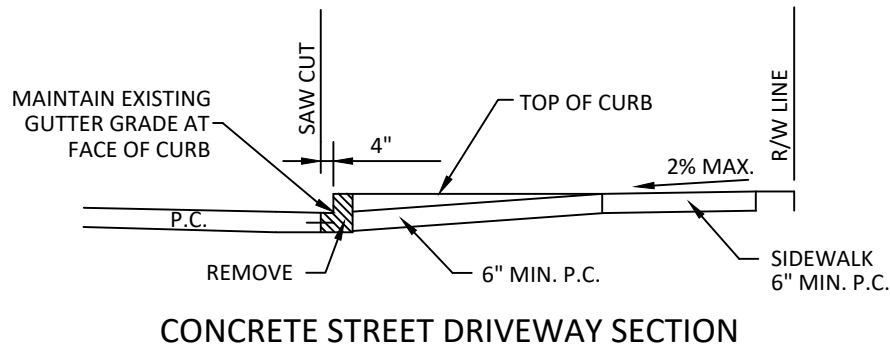
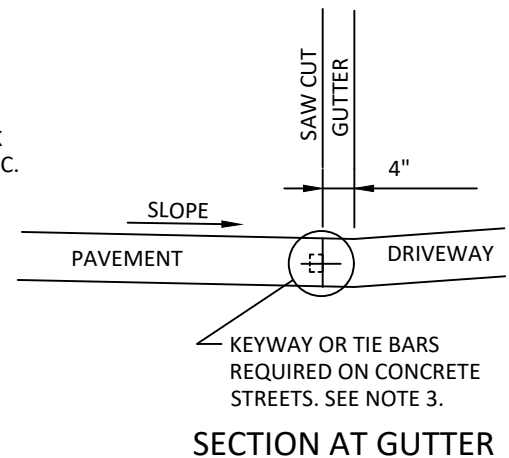
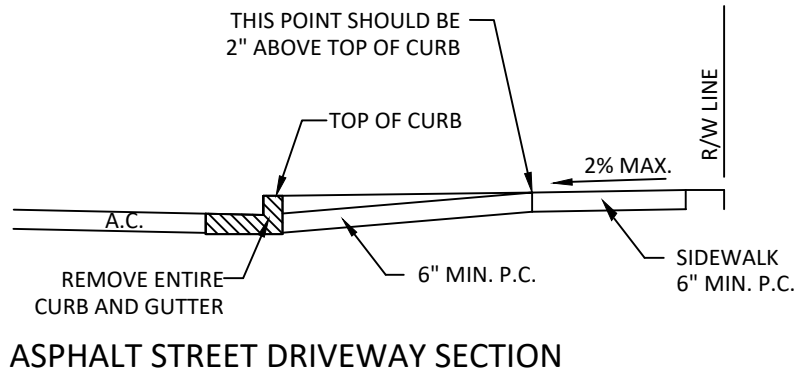
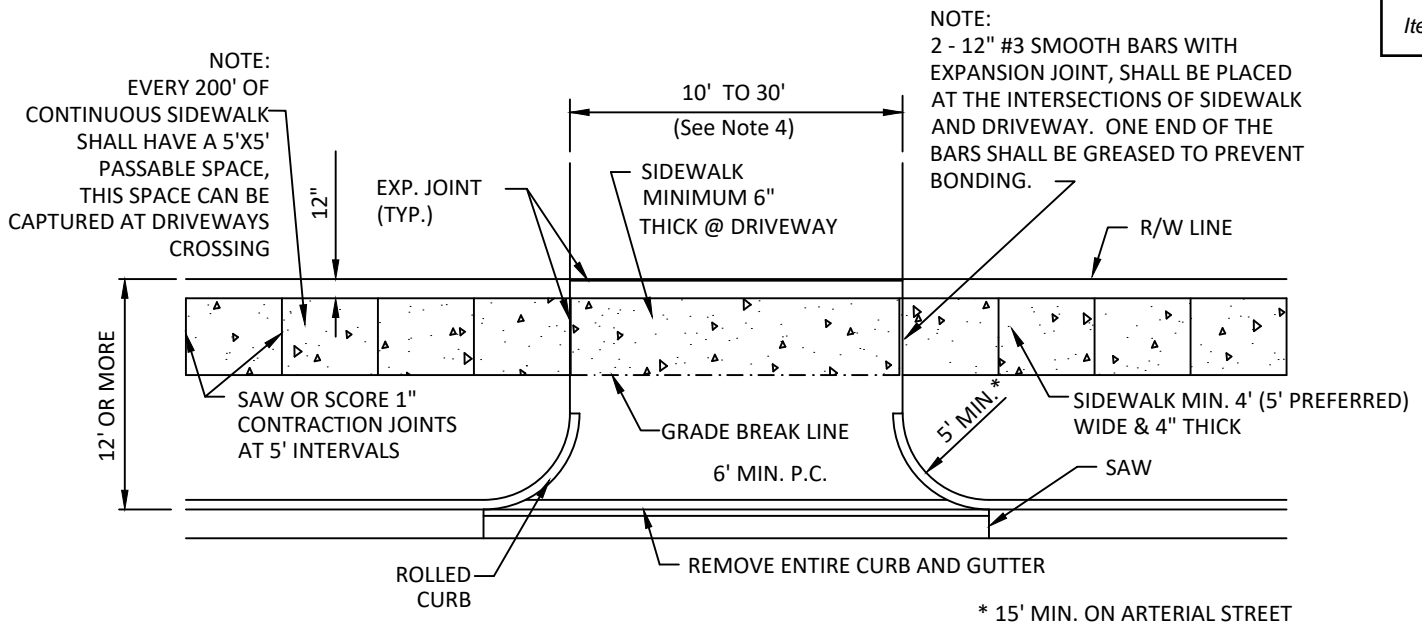
REVISION DATE: 01/2023

REV. NO.

1

DRAWING NO.

ST 15



NOTES:

1. REFER TO DRIVEWAY APPROACH STANDARDS ST-24 THROUGH ST-27.
2. IF THE CONCRETE STREET IS CONSTRUCTED WITH A SEPARATE CURB AND GUTTER, THE ENTIRE CURB AND GUTTER SHALL BE REMOVED WHEN CONSTRUCTING A DRIVEWAY APPROACH.
3. IF CONCRETE DRIVEWAY APPROACH ABUTS A CONCRETE STREET OR MOUNTABLE CURB THE DRIVEWAY SHALL BE CONNECTED TO THE STREET OR CURB USING A KEYWAY OR TIE BARS. THE TIE BARS SHALL BE #4 BARS 450 (18") LONG REQUIRED AT 600 (24") CENTERS.
4. IN THE HISTORIC DISTRICT, THE MINIMUM DRIVEWAY WIDTH SHALL BE 8 FEET AND THE MAXIMUM 10 FEET. ALSO TWO STRIPS OF CONCRETE 18" WIDE SHALL BE ALLOWED.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

RESIDENTIAL DRIVEWAY, TYPE II DRIVEWAY APPROACH

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

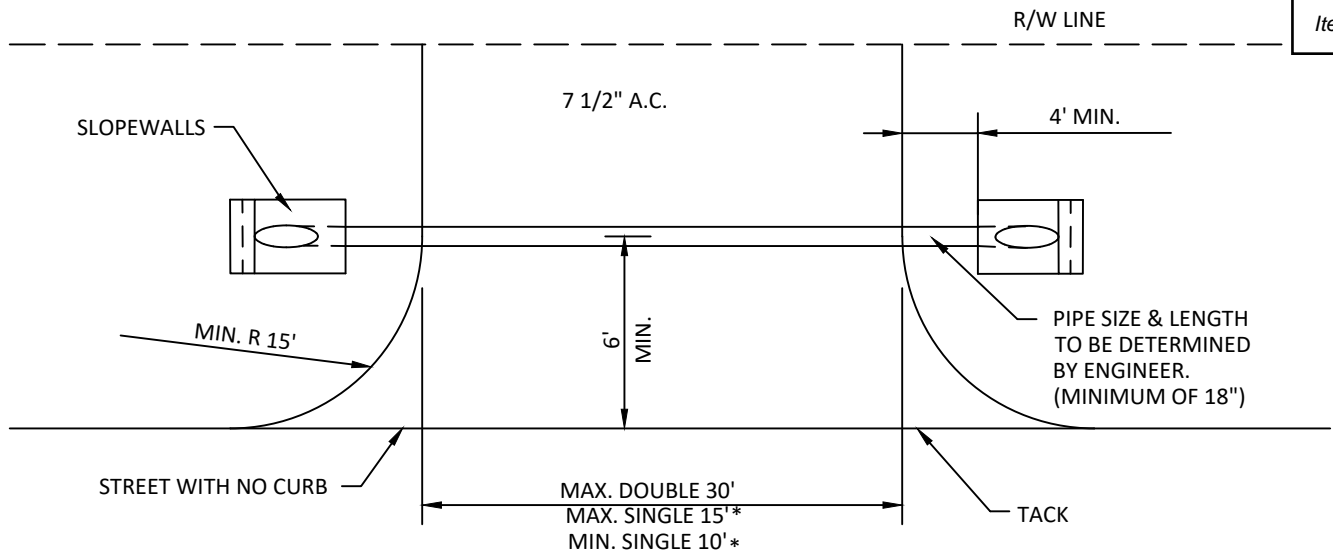
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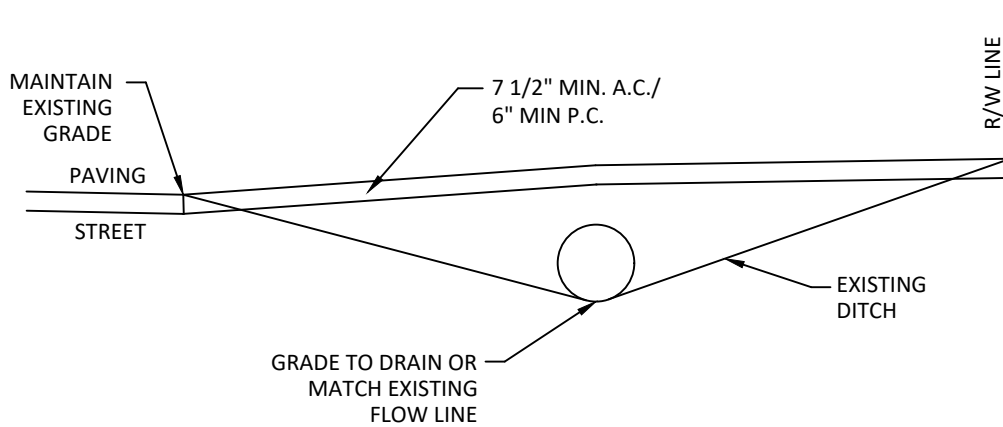
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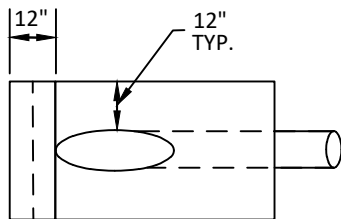
ST 16



* IN THE HISTORIC DISTRICT, THE MINIMUM DRIVEWAY WIDTH SHALL BE 8 FEET AND THE MAXIMUM 10 FEET. ALSO TWO STRIPS OF CONCRETE 18" WIDE SHALL BE ALLOWED.

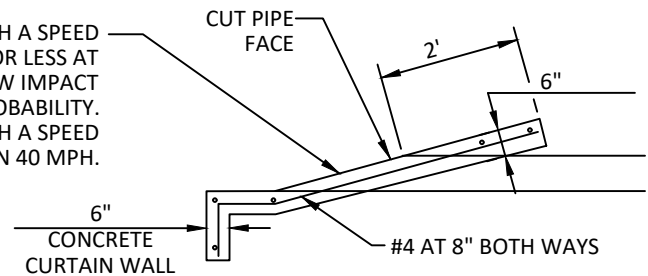


DRIVEWAY SECTION



PLAN

4:1 FOR ROADS WITH A SPEED LIMIT OF 40 MPH OR LESS AT LOCATIONS WITH LOW IMPACT PROBABILITY.
6:1 FOR ROADS WITH A SPEED LIMIT OF GREATER THAN 40 MPH.



ELEVATION

CONCRETE SLOPEWALL

NOTES:

1. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

RESIDENTIAL DRIVEWAY ON STREET WITHOUT CURB

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

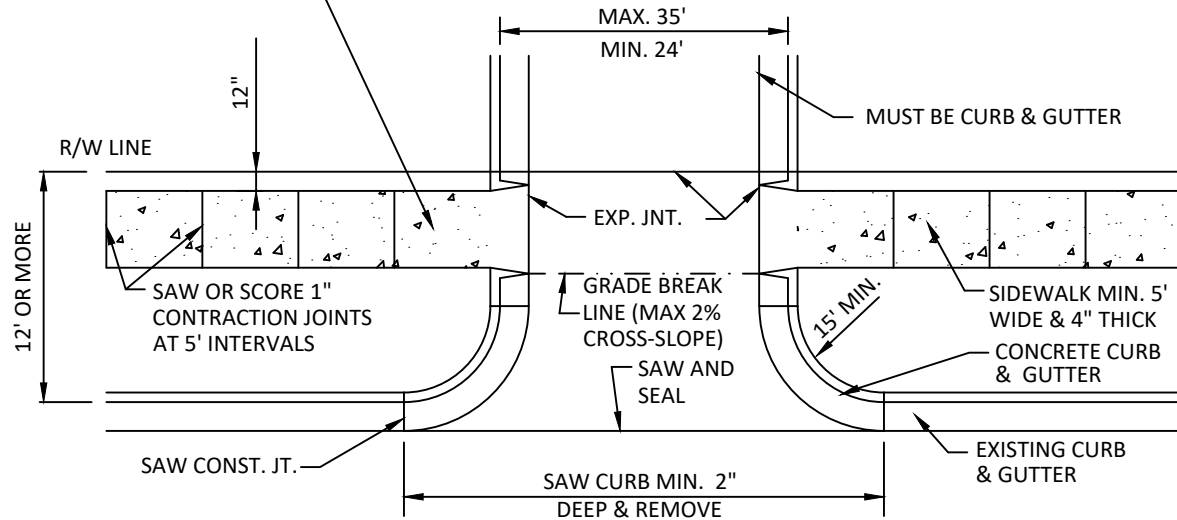
REV. NO.

3

DRAWING NO.

ST 17

ADVANCE SIDEWALK SLOPES FOR DRIVEWAY CROSSINGS SHALL NOT EXCEED 8.33% RUNNING SLOPES



NOTES:

1. DRIVEWAY SHALL BE DESIGNED TO ACCOMMODATE LARGEST TRUCK TO USE IT.
2. REFER TO DRIVE WAY APPROACH STANDARDS ST-24 THROUGH ST-27.
3. IF CONCRETE DRIVEWAY ABUTS AN ASPHALT STREET, SAWING AND SEALING WILL NOT BE REQUIRED. CONCRETE DRIVEWAY WILL NEED TO BE EDGED.
4. IF CONCRETE DRIVEWAY ABUTS A CONCRETE STREET THE DRIVEWAY SHALL BE CONNECTED TO THE STREET USING A KEYWAY OR TIE BARS. THE TIE BAR SHALL BE *4 BARS 18" LONG REQUIRED AT 24" CENTERS.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

COMMERCIAL DRIVEWAY, TYPE II DRIVEWAY APPROACH

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

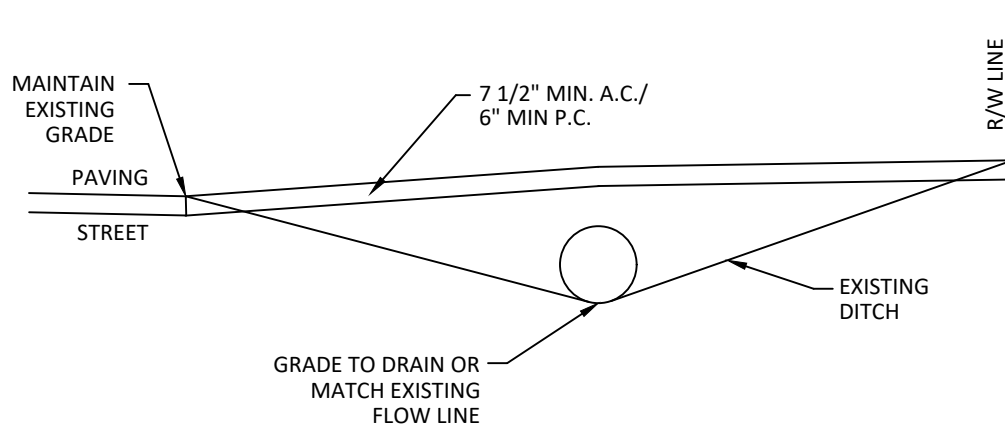
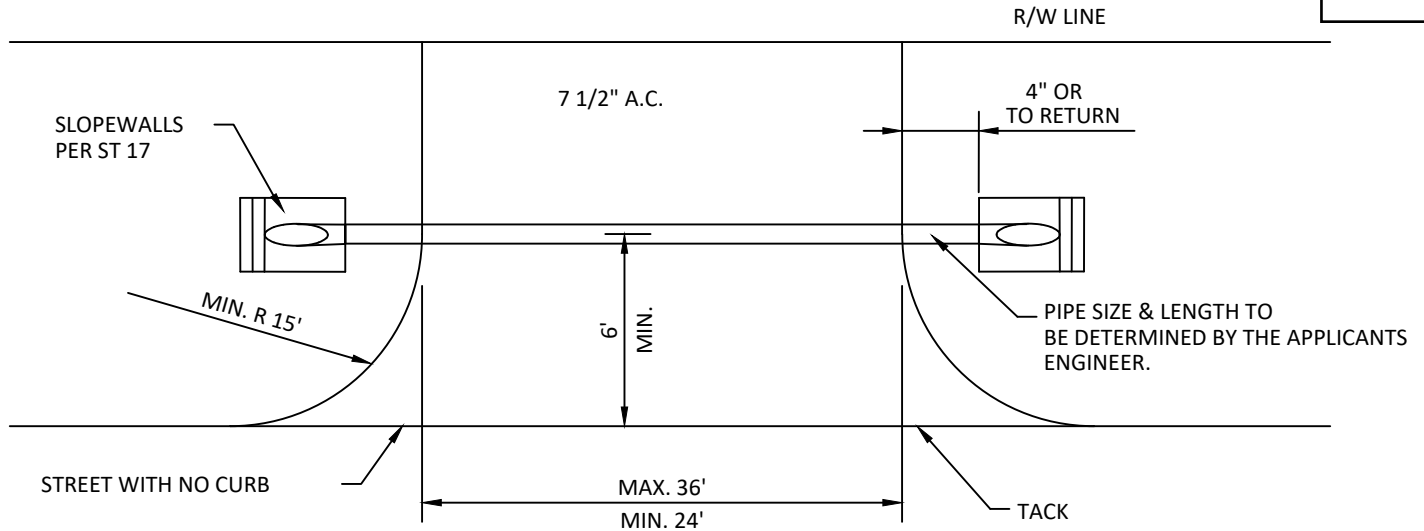
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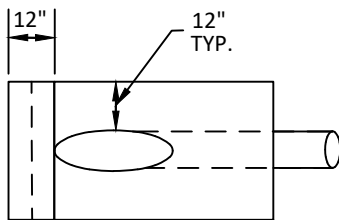
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DRAWING NO.

ST 18

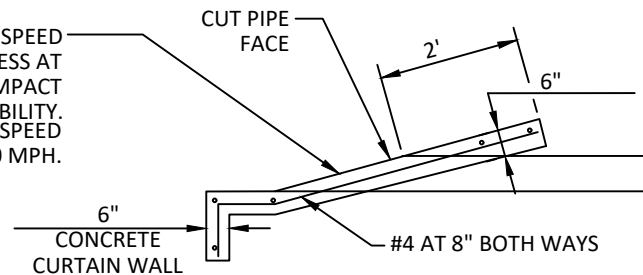


DRIVEWAY SECTION



PLAN

4:1 FOR ROADS WITH A SPEED LIMIT OF 40 MPH OR LESS AT LOCATIONS WITH LOW IMPACT PROBABILITY.
6:1 FOR ROADS WITH A SPEED LIMIT OF GREATER THAN 40 MPH.



ELEVATION

CONCRETE SLOPEWALL

NOTES:

1. REFER TO DRIVEWAY APPROACH STANDARDS ST-24 THROUGH ST-27.
2. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

COMMERCIAL DRIVEWAY ON STREET WITHOUT CURB

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

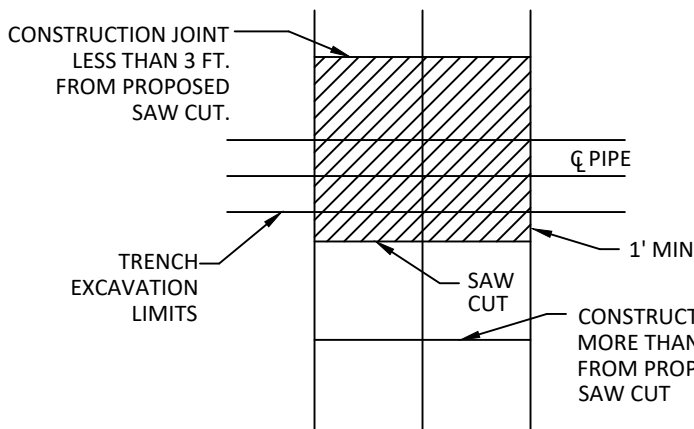
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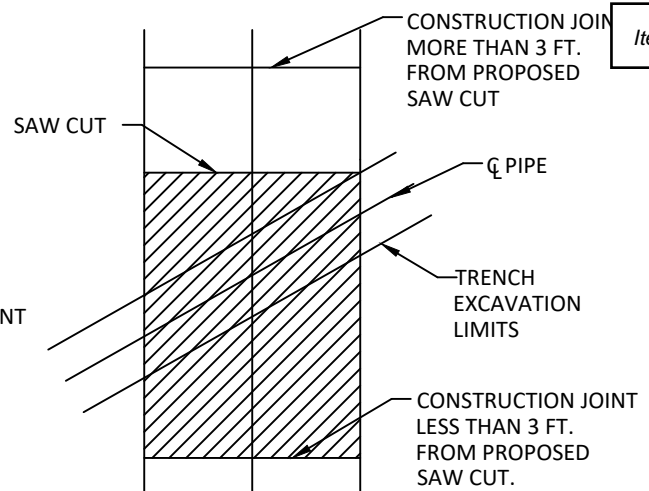
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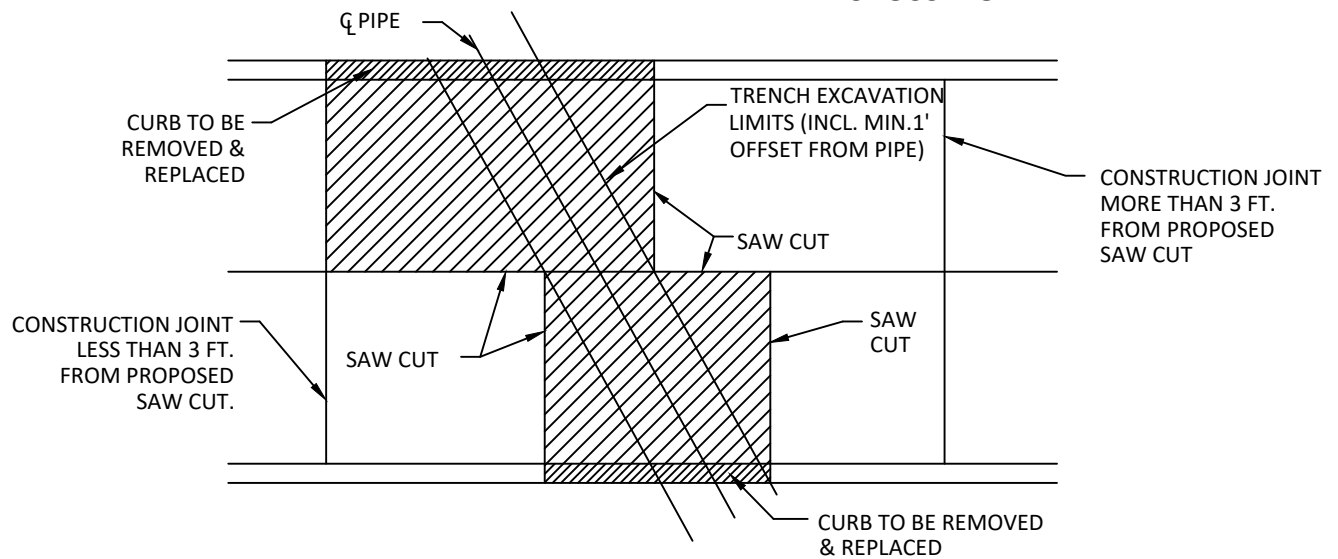
ST 19



TYP. STREET, DRIVEWAY, OR
SIDEWALK WITH RIGHT
ANGEL CROSSING



TYP. DRIVEWAY OR
SIDEWALK W/ DIAGONAL
CROSSING



TYPICAL STREET WITH DIAGONAL CROSSING

NOTES:

1. REMOVE AND REPLACE PAVEMENT WITHIN SHADED AREAS BOUNDED BY SAW CUTS AND/OR CONSTRUCTION JOINTS.
2. FOR DIAGONAL CROSSING, REPLACE PAVEMENT USING SQUARED CUTS, AS SHOWN. PAY QUANTITY WILL INCLUDE SQUARED AREA.
3. REMOVE AND REPLACE PAVEMENT TO CONSTRUCTION JOINT IF LESS THAN 3 FT. FROM PROPOSED SAW CUT. EXTRA AREA WILL BE INCLUDED IN PAY QUANTITY.
4. FOR LONGITUDINAL INSTALLATIONS: REMOVE AND REPLACE PAVEMENT AND CURB TO EDGE OF STREET, IF THE SAW CUT IS LESS THAN 3 FT. FROM THE OUTSIDE EDGE OF THE PAVEMENT OR CURB. AVOID SAW CUTS IN THE EXISTING WHEEL LINE. TRENCHES EXCEEDING 300 L.F. SHALL BE BACKFILLED AND MADE DRIVABLE.
5. ALL CONSTRUCTION JOINTS SHALL BE REESTABLISHED IN ACCORDANCE WITH THE CITY OF NORMAN STANDARDS FOR PORTLAND CEMENT CONCRETE PAVEMENT. WHEN A NEW PAVEMENT SECTION IS REMOVED ALONG AN EXISTING LONGITUDINAL CONSTRUCTION JOINT, THE NEW PAVEMENT SHALL BE DOWELED TO THE PAVEMENT ADJACENT TO THE JOINT.
6. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

STANDARD PAVEMENT CUTS

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO.

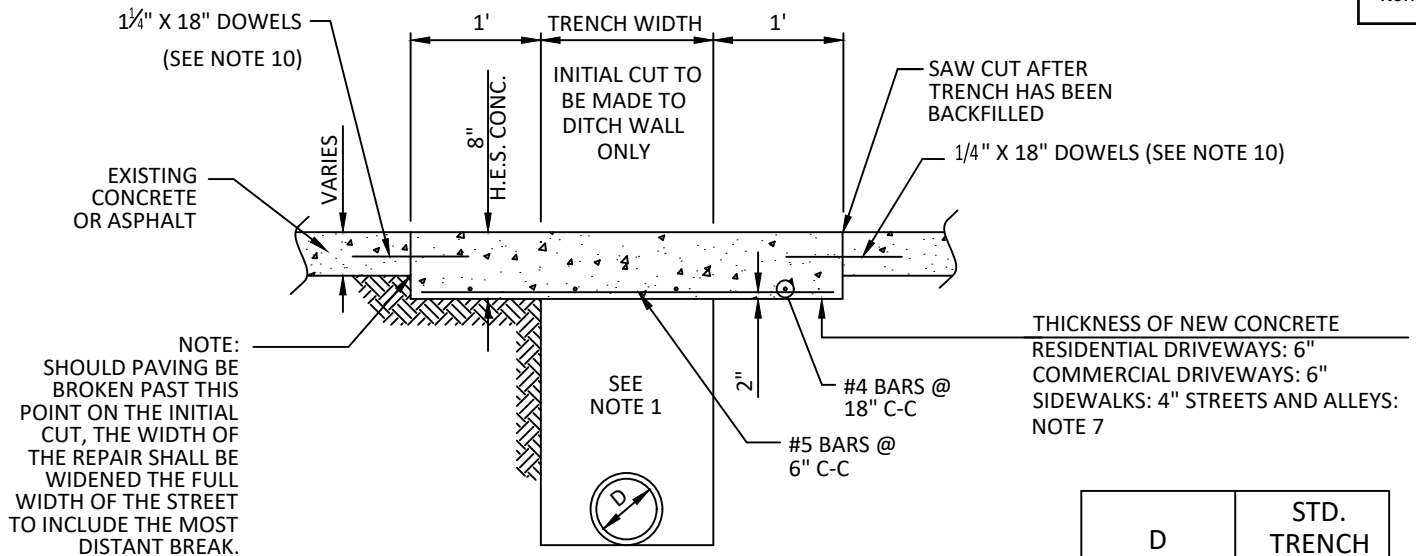
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DRAWING NO.

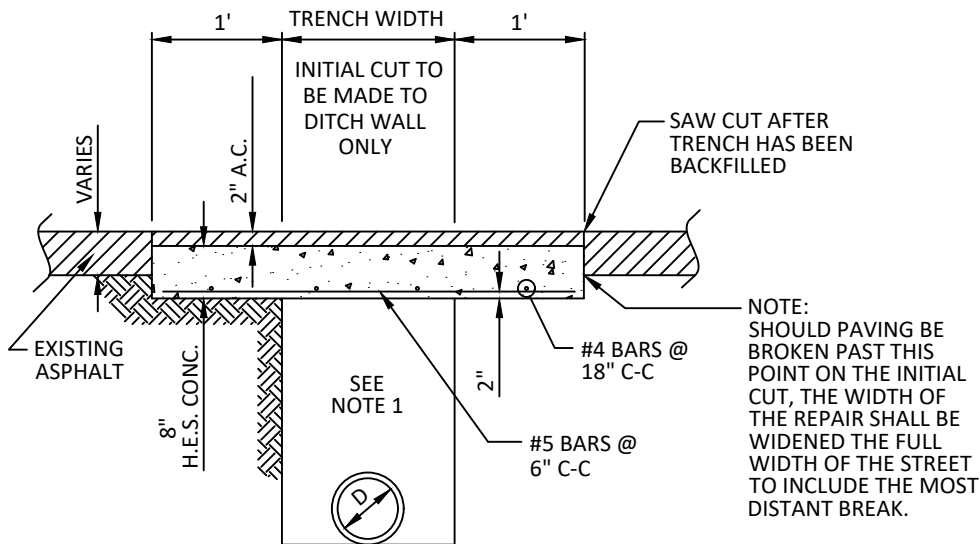
ST 20

345

Item 6.



CONCRETE PAVEMENT



D IN.	STD. TRENCH WIDTH IN.
6	18
8	24
10	30
12	30
15	36
18	36
21	42
24	42
27	48
30	48
33	54
36	54
42	60
54	72
60	78
66	84

NOTES: ASPHALT PAVEMENT

1. ALL PUBLIC ROADS AND DRIVE CROSSINGS ARE TO BE BACKFILLED WITH ODOT 703.01 TYPE A AGGREGATE BASE OR FLOWABLE FILL.
2. REMOVE AND REPLACE PAVEMENT TO NEAREST JOINT IF PROPOSED SAW CUT IS LESS THAN 3' FROM JOINT.
3. NO PAYMENT WILL BE MADE FOR REPLACEMENT OF PAVEMENT OUTSIDE OF STD. PAY WIDTH DUE TO TRENCH EXCAVATION WIDER THAN STANDARD TRENCH WIDTH.
4. PAY QUANTITY WILL INCLUDE REPLACEMENT OF PAVEMENT DUE TO SQUARING OF DIAGONAL CUTS.
5. FOR SERVICE LINES 52" AND SMALLER, THE STD. PAY WIDTH SHALL BE 2.2'.
6. WHERE TRENCH EXCAVATION IS WITHIN 12" OF BACK OF CURB STANDARD NO. GC-02 SHALL APPLY.
7. NEW PCC TO BE 2" THICKER THAN EXISTING PAVING, 8" MINIMUM.
8. CONCRETE SHALL BE 3500 PSI HIGH EARLY STRENGTH CONCRETE PER ODOT 701.01(A).
9. CITY ENGINEER SHALL DECIDE WHICH TYPE OF REPAIR TO MAKE.
10. 1" DIA. BY 18" LONG DOWELS SPACED AT 12" CENTERS ARE REQUIRED IF ADJACENT PAVEMENT IS CONCRETE.
11. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

PAVEMENT REMOVAL AND REPLACEMENT

CITY ENGINEER APPROVAL:

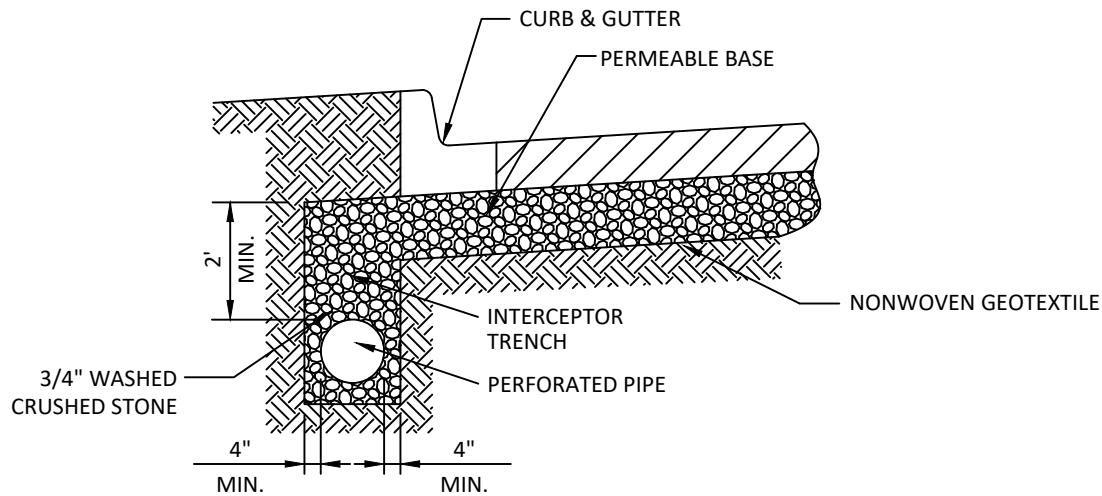
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

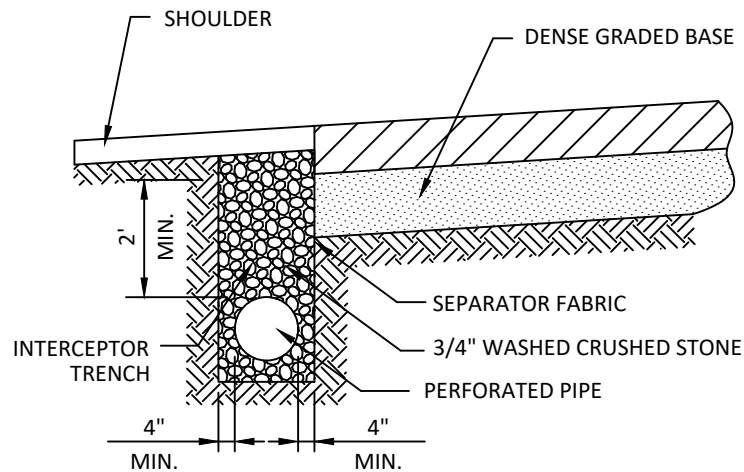
REVISION DATE: 01/2023

REV. NO. 3

DRAWING NO. ST 21



CROSS SECTION OF NEW PAVEMENT WITH DRAINAGE SYSTEM



CROSS SECTION OF DRAINAGE IMPROVEMENT TO EXISTING PAVEMENT

NOTES:

1. MINIMUM PERFORATED PIPE SIZE IS 4" DIAMETER.
2. PERFORATED PIPES SHALL BE TIED TO THE STORM SEWER SYSTEM.
3. ON STREETS WITH CURB AND GUTTER, THE DRAIN SHALL BE OUTSIDE OF BUT ADJACENT TO THE CURB.
4. PIPE MATERIAL SHALL BE POLYETHYLENE PIPE THAT MEETS ASTM F405 SPECIFICATIONS.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

BASE DRAINAGE

CITY ENGINEER APPROVAL:

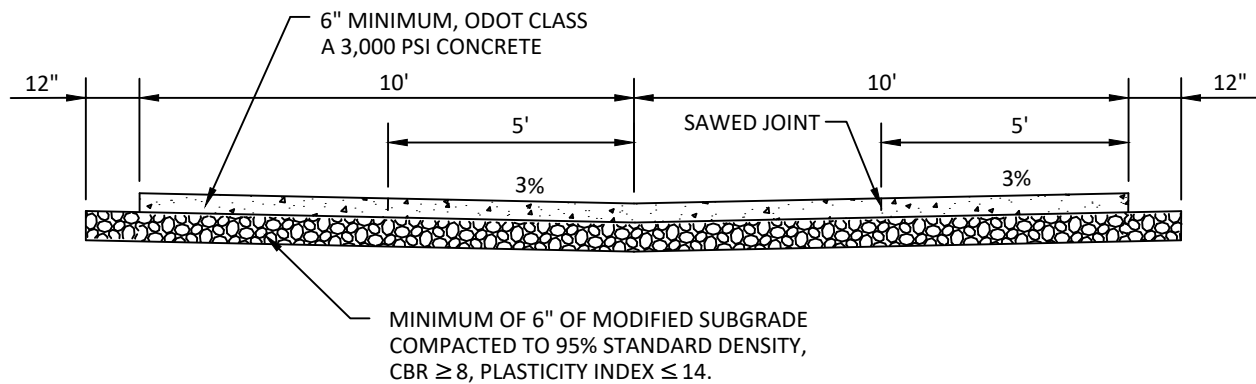
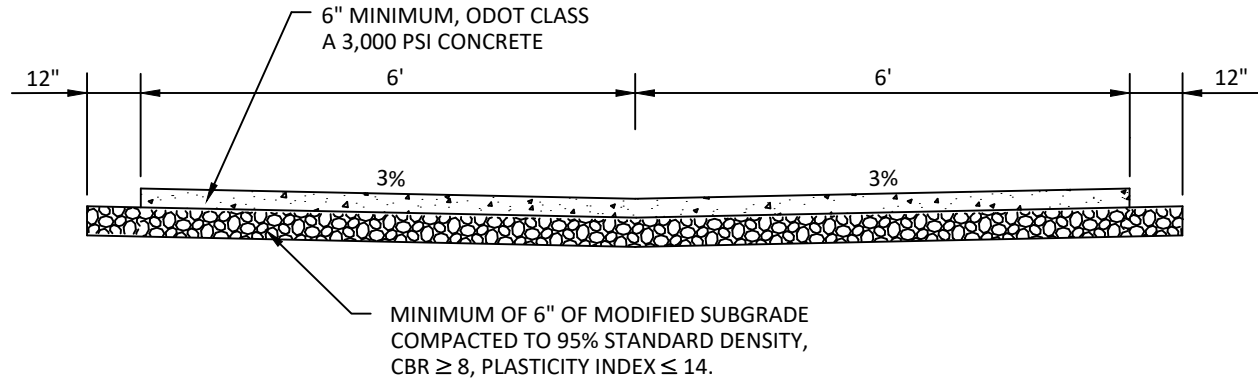
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 1

DRAWING NO. ST 22



NOTES:

1. PAVING SECTION SHOWN IS MINIMUM ALLOWED. PAVING SHALL BE DESIGNED IN ACCORDANCE WITH THE CITY'S "ENGINEERING DESIGN CRITERIA".
2. LONGITUDINAL AND TRANSVERSE JOINTS SHALL BE IN ACCORDANCE WITH THE CITY'S "STANDARD SPECIFICATIONS" PAVING CONSTRUCTION SECTION 2304.4(B) & 2304.4(C).
3. PAVING CONSTRUCTION TO BE MONOLITHIC, NO CONSTRUCTION JOINTS.
4. THE MINIMUM RADIUS SHALL BE 20 FEET FOR RETURNS AT THE INTERSECTION OF AN ALLEY AND STREET. IF DEEMED NECESSARY, THE CITY ENGINEER MAY REQUIRE A LARGER RADIUS. FOR AN EXISTING ALLEY BEING RECONSTRUCTED, ON SITE CONDITIONS MAY WARRANT A SMALLER RADIUS IF APPROVED BY THE CITY ENGINEER.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

ALLEY PAVING

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

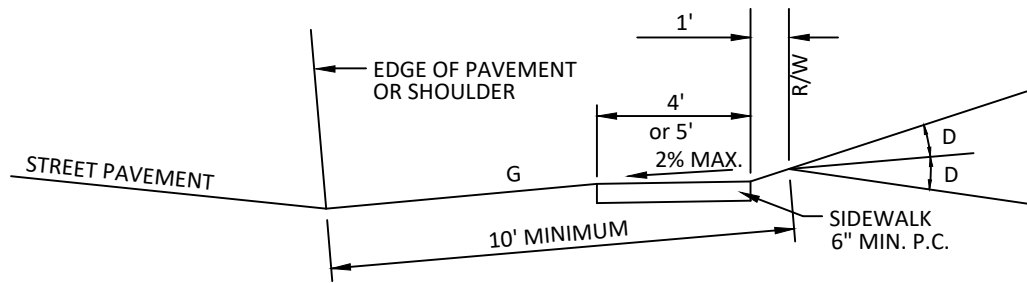
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REV. NO.

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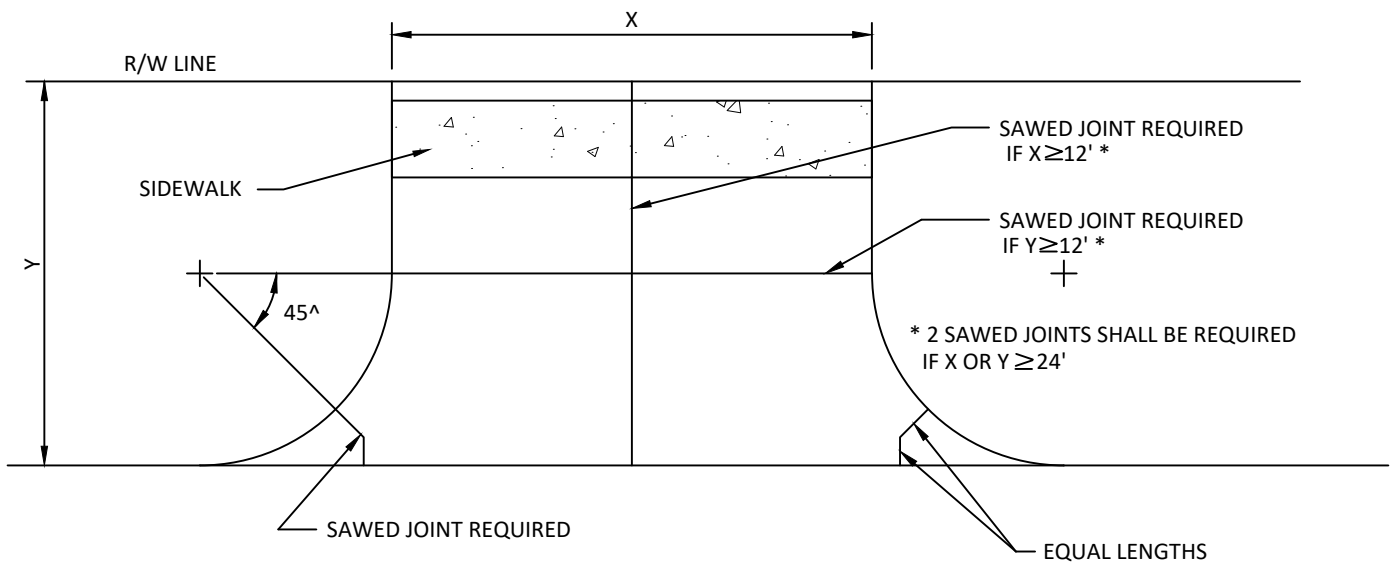
ST 23



DRIVEWAY GRADES

ELEMENT	DRIVEWAY	FUNCTIONAL CLASSIFICATION		
		ARTERIAL	COLLECTOR/DISTRIBUTOR	LOCAL
RECOMMENDED GRADES (G)	RESIDENTIAL	DESIRABLE: 0-10% MAXIMUM: 10%		
	COMMERCIAL/INDUSTRIAL	DESIRABLE: 0-5% MAXIMUM: 8%		
CHANGE IN GRADE (D) WITHOUT VERTICAL CURVE	ALL	8% OR LESS	9% OR LESS	12% OR LESS

APPROACH GRADE



CONTRACTION JOINTS

NOTES:

- REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

DRIVEWAY APPROACH - GRADES & CONTRACTION JOINTS

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

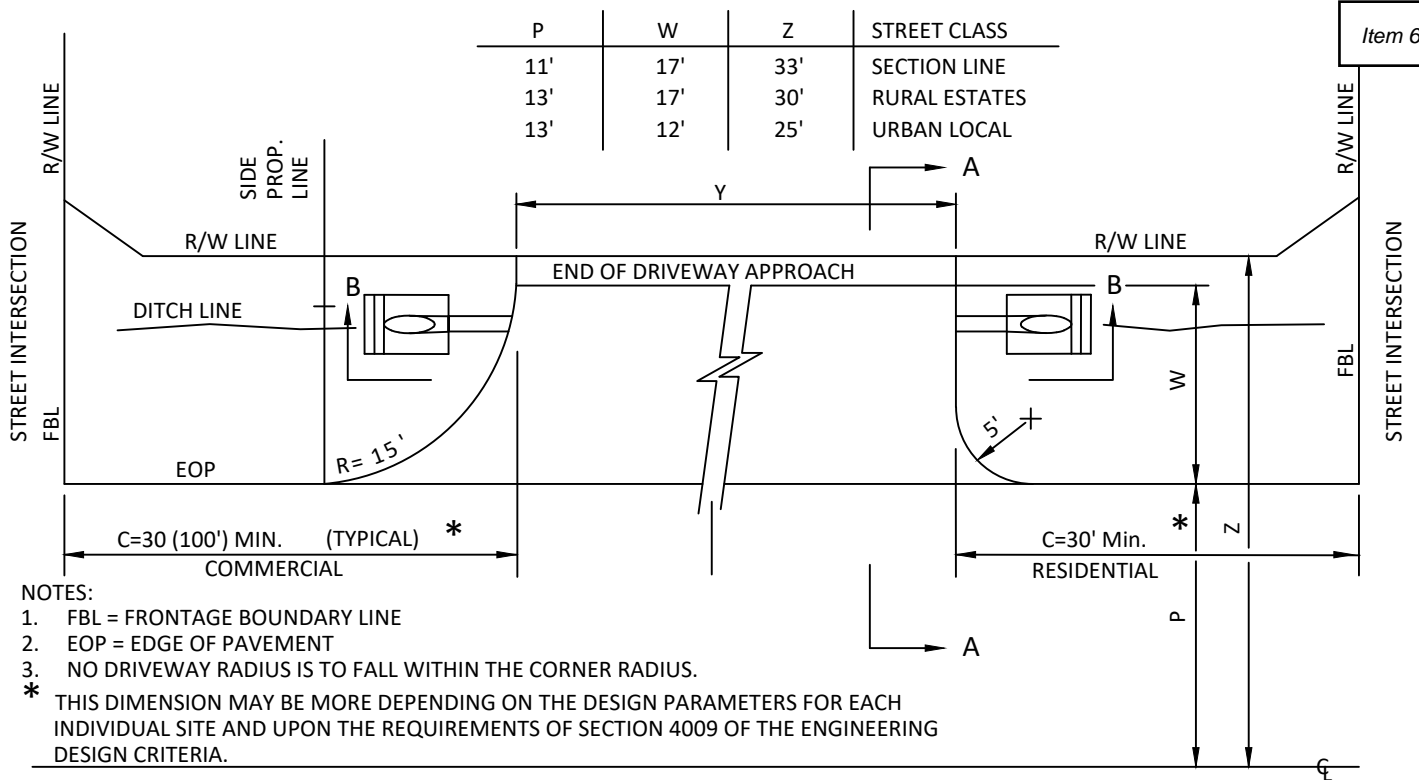
REVISION DATE: 01/2023

REV. NO.

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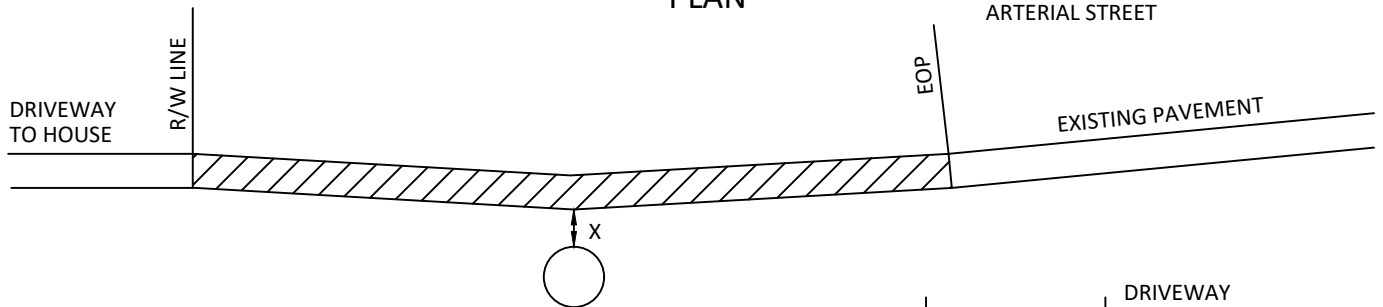
DRAWING NO.

ST 24



PLAN

* 15' MIN. ON ARTERIAL STREET

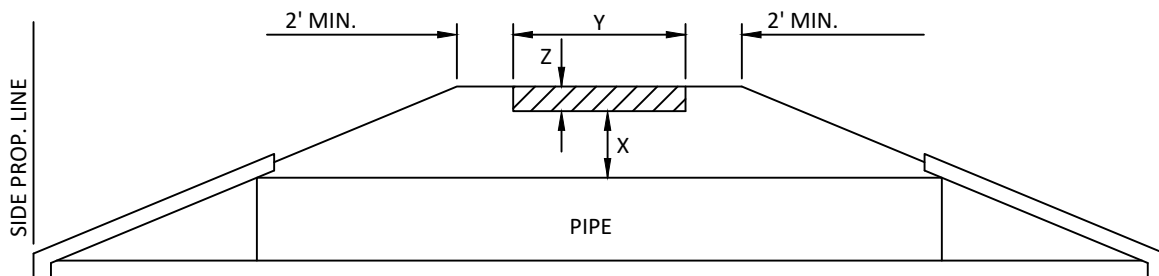


SECTION A-A

Y	TYPE DRIVE
10'-30'	RESIDENTIAL
35' MAX.	COMMERCIAL

X	Z	DRIVEWAY APPROACH MATERIAL
3"	6"	CONCRETE
6"	4" *	ASPHALT
9"	5"	OTHER

* X=1' AND Z=8" FOR COMMERCIAL



SECTION B-B

NOTES:

1. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

TYPE I DRIVEWAY APPROACH ON STREET WITH SIDE DITCHES

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

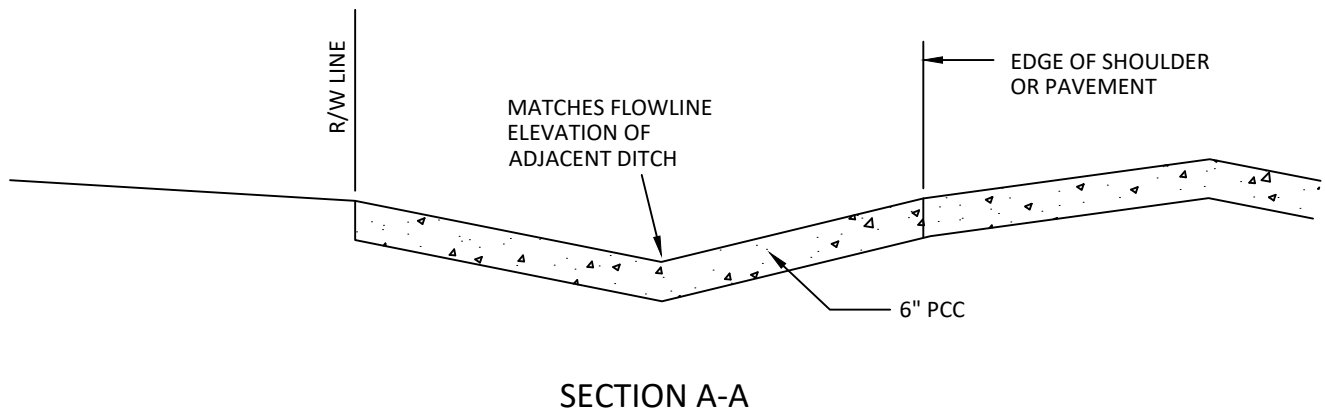
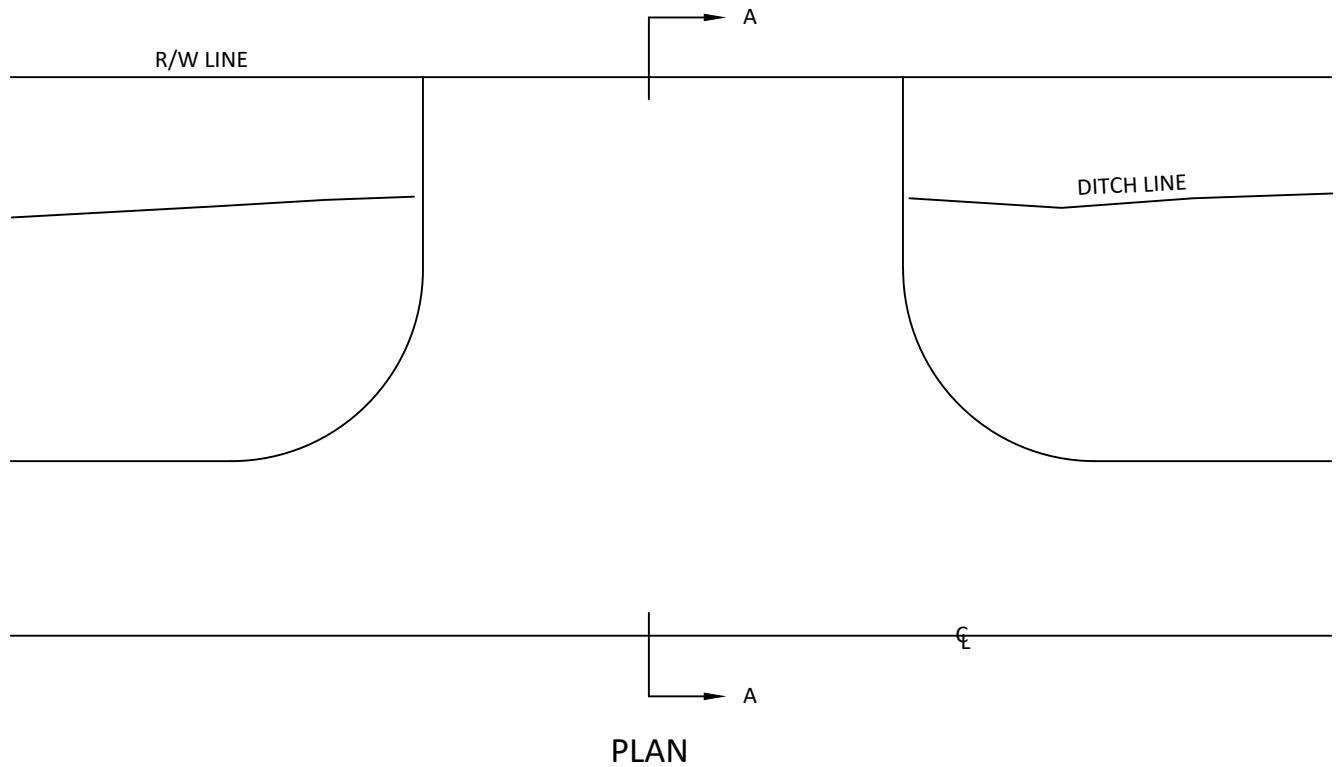
REV. NO.

2

DRAWING NO.

ST 25

350

**NOTES:**

1. NO DRAINAGE PIPE REQUIRED IF THE EXISTING DRAINAGE DITCH IS SHALLOW (LESS THAN ONE FOOT DEEP FROM THE EDGE OF PAVEMENT) AND THE EXISTING DRAINAGE AREA IS SMALL (THE QUANTITY OF STORM WATER PRODUCED BY A FIFTY YEAR RAINFALL SHALL REMAIN ENTIRELY WITHIN THE DITCH AND NOT TOUCH THE STREET PAVEMENT).
2. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

DRIVEWAY APPROACH-TYPE I (STREET WITH DITCHES, NO PIPE)

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

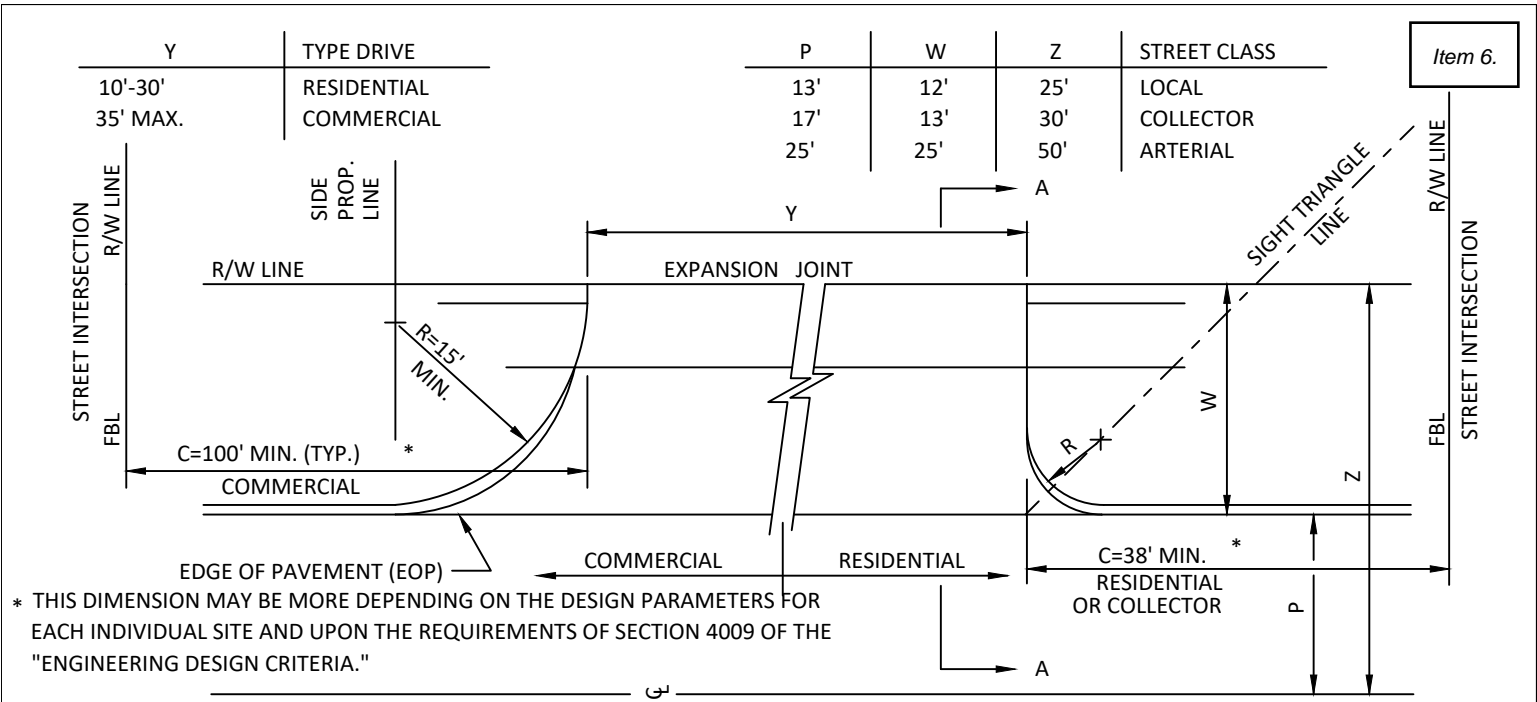
REV. NO.

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DRAWING NO.

ST 26

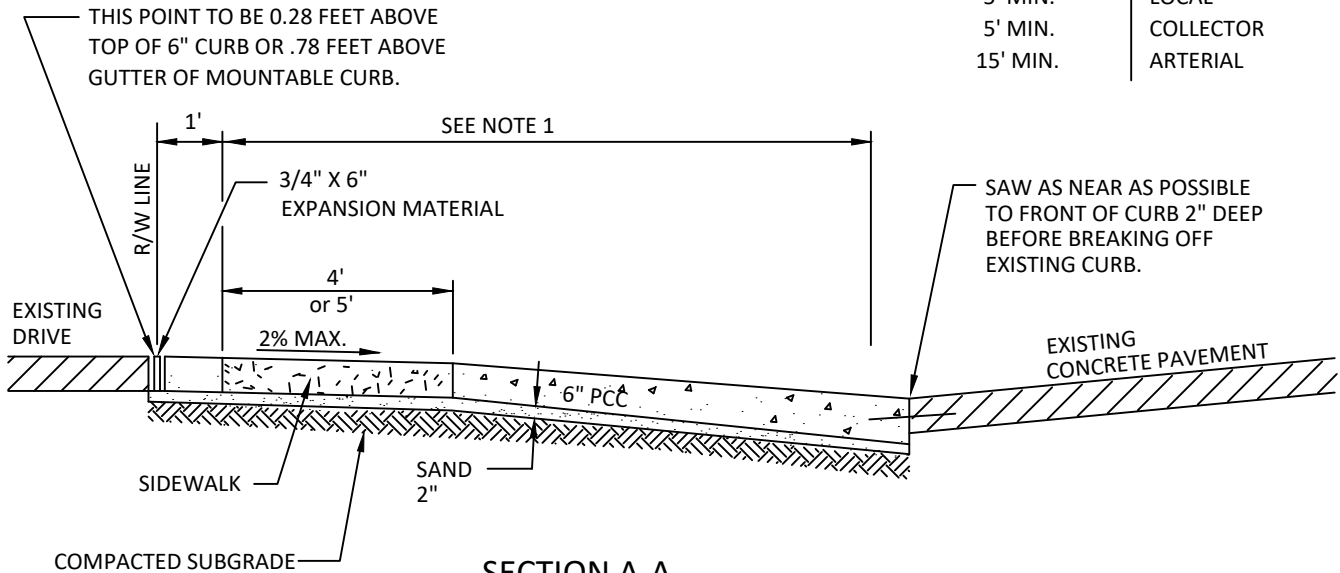
351



NOTES:

1. FBL = FRONTAGE BOUNDARY LINE
2. NO DRIVEWAY RADIUS IS TO FALL WITHIN THE CORNER RADIUS.

PLAN



SECTION A-A
(DRIVEWAY SECTION)

NOTES:

1. TYPICALLY 23.33 FEET FOR COMMERCIAL DRIVEWAY (SEE NOTE 2), 11.33 FEET FOR RESIDENTIAL DRIVEWAY ON LOCAL STREET AND 12.33 FEET FOR RESIDENTIAL DRIVEWAY ON A COLLECTOR STREET.
2. IF LESS THAN TYPICAL, THE APPROACH GRADE MAY BE STEEPER THAN RECOMMENDED ON DRAWING ST-24. THE STEEPER GRADE MAY BE APPROVED BY THE CITY ENGINEER ON A CASE BY CASE BASIS.
3. IF CONCRETE DRIVEWAY APPROACH ABUTS A CONCRETE STREET OR MOUNTABLE CURB THE DRIVEWAY SHALL BE CONNECTED TO THE STREET OR CURB USING A KEYWAY OR TIE BARS. THE TIE BARS SHALL BE #4 BARS 450 (18") LONG REQUIRED AT 600 (24") CENTERS.
4. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

TYPE II APPROACH ON STREET WITH CURB & GUTTER

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

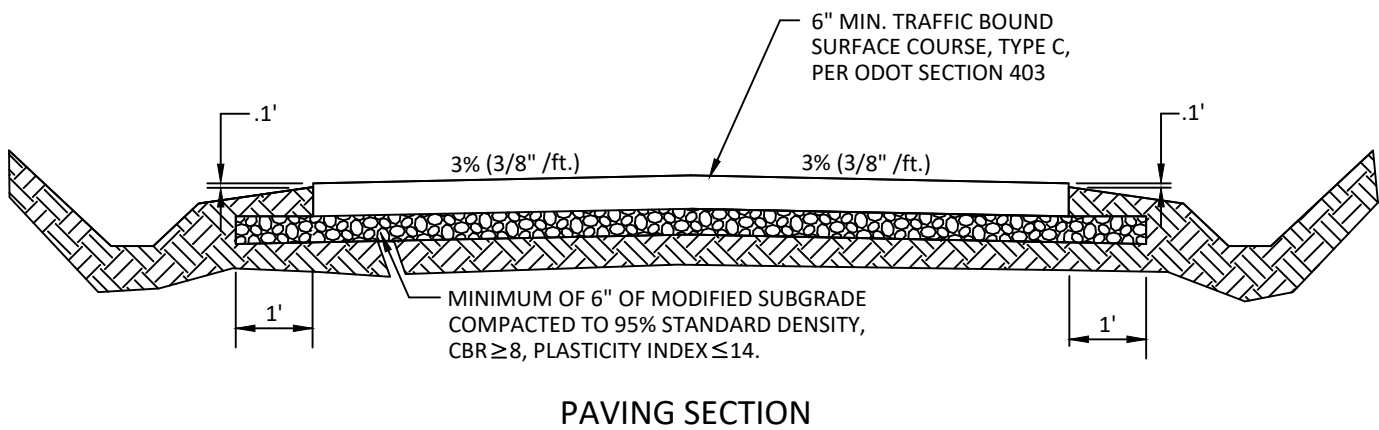
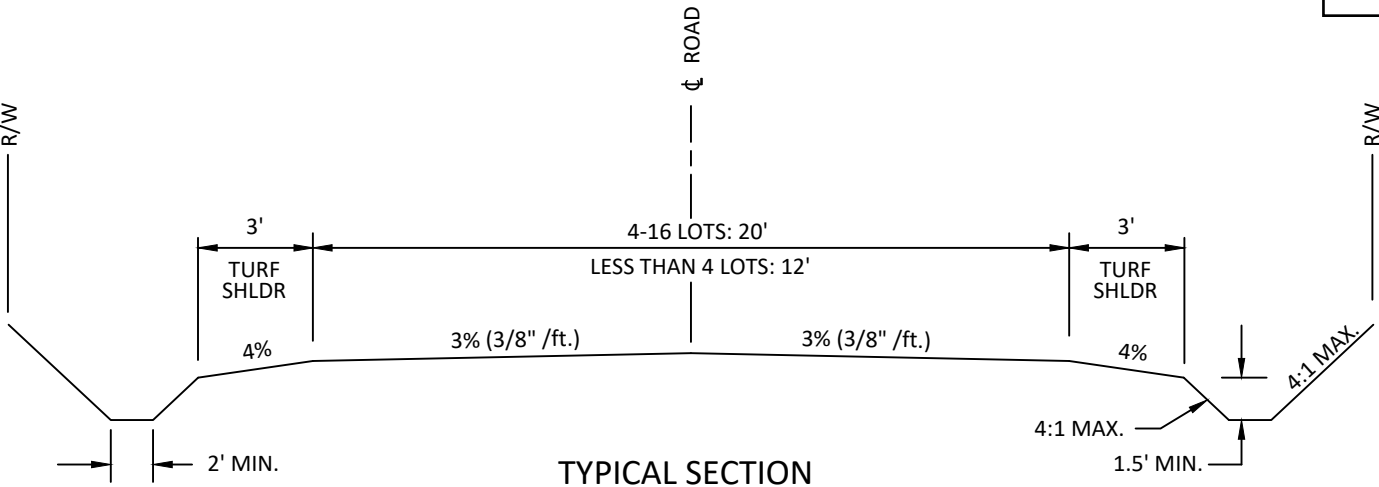
REVISION DATE: 01/2023

REV. NO.

4

DRAWING NO.

ST 27



NOTES:

1. TRAFFIC BOUND SURFACE COURSE (TBSC) AND SUBGRADE SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. TBSC SHALL BE CONSTRUCTED IN ACCORDANCE WITH ODOT STANDARD SPECIFICATIONS, SECTION 310, METHOD A.
3. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATIONAL AND SECTION REQUIREMENTS.

RURAL PRIVATE ROAD

CITY ENGINEER APPROVAL:

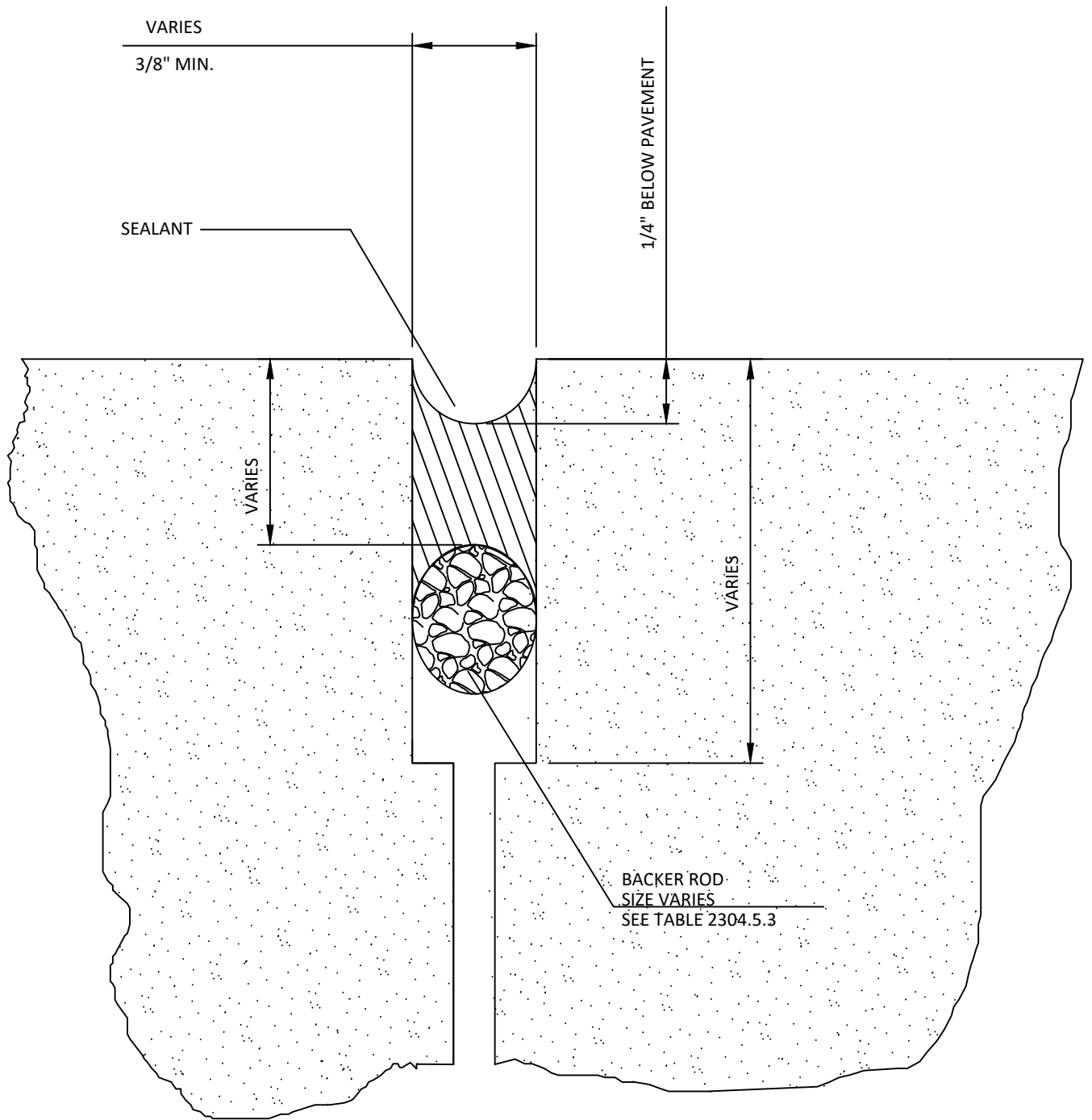
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 2

DRAWING NO. ST 28



JOINT SEALING DETAIL

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO.

1

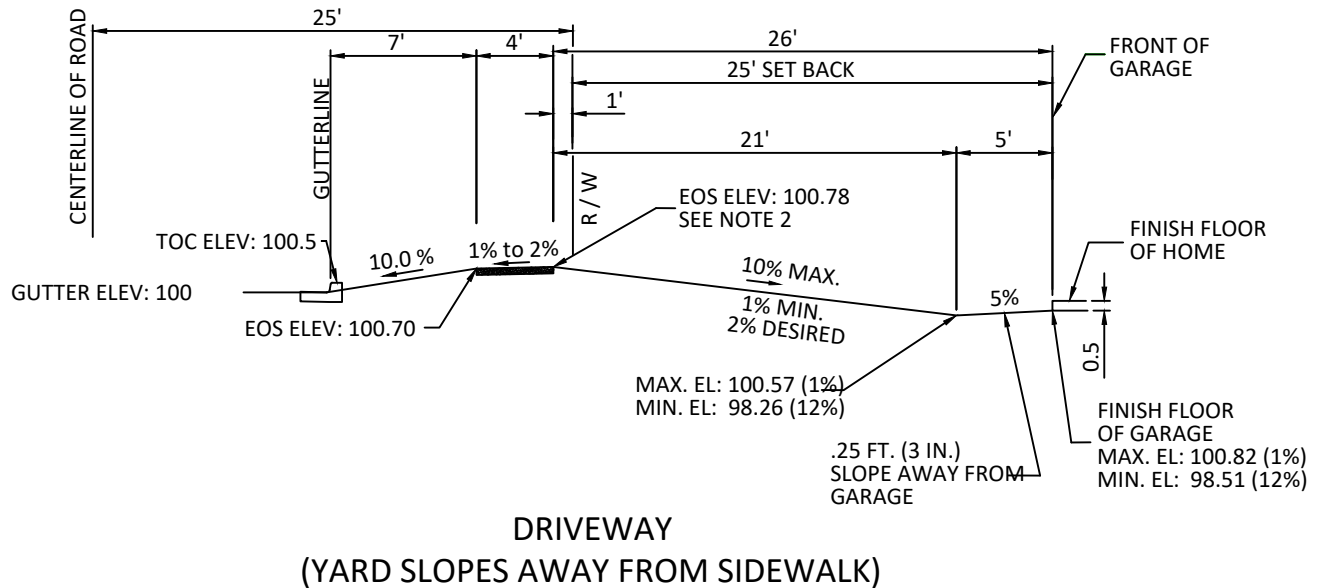
DRAWING NO.

ST 29

	GUTTERLINE TO FINISH FLOOR OD GARAGE
MAX. ABOVE	3.90 FT. (3 FT., 10 3/4IN.)
MIN. ABOVE	1.04 FT. (1 FT., 0 1/2 IN.)

1. MUST HAVE A MINIMUM OF 5% SLOPE (3" IN 5') AWAY FROM THE SIDES OF THE HOUSE FOR AT LEAST 5 FT.
2. THIS POINT IS .28 FT. (3 3/8 IN.) ABOVE TOP OF 6" CURB OR 0.78 FT. ABOVE GUTTER.
3. THIS IS BASED ON A 1% FRONT YARD GRADE FROM THE HOUSE TO THE SIDEWALK.
4. THIS IS A TYPICAL DRAWING. THIS DRAWING MAY BE AMENDED BY THE CITY ENGINEER ON A CASE BY CASE BASIS.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATIONAL AND DRIVEWAY REQUIREMENTS.

CITY ENGINEER APPROVAL:		CITY OF NORMAN, OKLAHOMA		355
APPROVAL DATE:	REVISION DATE: 01/2023	REV. NO. 4	DRAWING NO. ST 30	



	GUTTERLINE TO FINISH FLOOR OF GARAGE
MAX. BELOW THE GUTTERLINE	1.49 FT. (1 FT., 5 7/8 IN.)
MAX. ABOVE THE GUTTERLINE	.82 FT. (9 7/8 IN.)

NOTES :

1. MUST HAVE A MINIMUM OF 5% SLOPE (3" IN 5') AWAY FROM THE SIDES OF THE HOUSE FOR AT LEAST 5 FT.
2. THIS POINT IS .28 FT. (3 3/8 IN.) ABOVE TOP OF 6" CURB OR 0.78 FT. ABOVE GUTTER.
3. THIS IS BASED ON A 1% FRONT YARD GRADE FROM THE HOUSE TO THE SIDEWALK.
4. THIS IS A TYPICAL DRAWING. THIS DRAWING MAY BE AMENDED BY THE CITY ENGINEER ON A CASE BY CASE BASIS.
5. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

REQUIRED RESIDENTIAL DRIVEWAY GRADES-LOCAL STREET

(HOUSE BELOW STREET LEVEL)

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

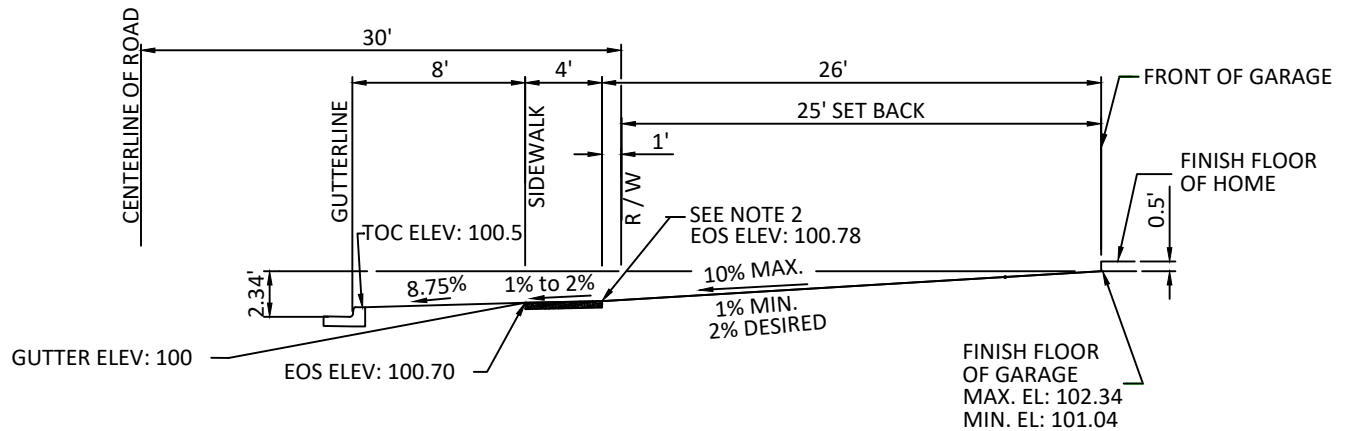
REVISION DATE: **01/2023**

REV. NO.

3

DRAWING NO.

ST 31



DRIVEWAY
(YARD SLOPES TO SIDEWALK)

	GUTTER LINE TO FINISH FLOOR OF GARAGE
MAX. ABOVE	2.34 FT. (2 FT., 4 IN.)
MIN. ABOVE	1.04 FT. (1 FT., 0 1/2 IN.)

NOTES:

- MUST HAVE A MINIMUM OF 5% SLOPE (3" IN 5') AWAY FROM THE SIDES OF THE HOUSE FOR AT LEAST 5 FT.
- THIS POINT IS .28 FT. (3 3/8 IN.) ABOVE TOP OF 6" CURB OR 0.78 FT. ABOVE GUTTER.
- THIS IS BASED ON A 1% FRONT YARD GRADE FROM THE HOUSE TO THE SIDEWALK.
- THIS IS A TYPICAL DRAWING. THIS DRAWING MAY BE AMENDED BY THE CITY ENGINEER ON A CASE BY CASE BASIS.
- REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

REQUIRED RESIDENTIAL DRIVEWAY GRADES-COLLECTOR ST.
(HOUSE ABOVE STREET LEVEL)

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

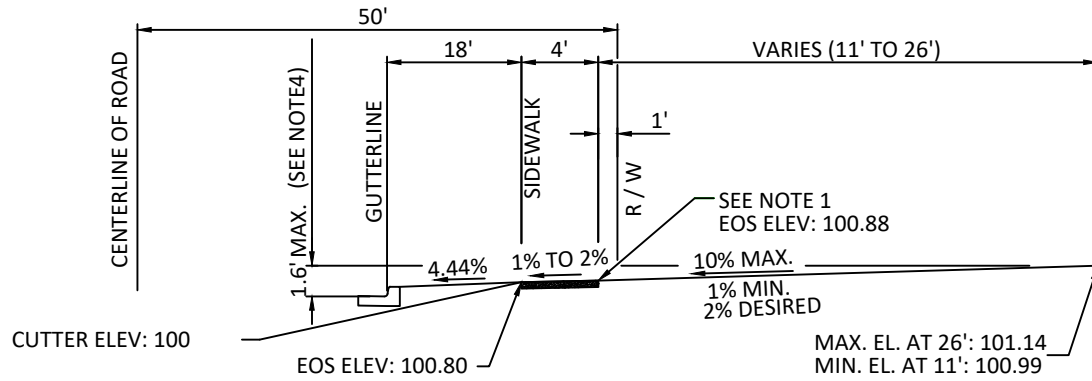
REVISION DATE: **01/2023**

REV. NO.

4

DRAWING NO.

ST 32



DRIVEWAY (YARD SLOPES TO SIDEWALK)

	GUTTER LINE TO FINISH ELEVATION OF PARKING AREA
MAX. ABOVE	SEE NOTE 3
MIN. ABOVE	0.99 FT. (11 7/8 IN.) FOR 10 FT. SET BACK, (SEE NOTE 2) 1.14 FT. (1 FT., 1 11/16 IN.) FOR 25 FT. SET BACK, (SEE NOTE 2)

NOTES:

1. THIS POINT IS AT LEAST 0.38 FT. (4 1/2 ") ABOVE TOP OF 6" CURB OR 0.88 FT. ABOVE GUTTER.
2. THIS IS BASED ON A 1% FRONT AREA GRADE FROM THE BUILDING TO THE SIDEWALK.
3. IN COMMERCIAL AREAS, THERE WILL BE A 10FT. OR 25 FT. SET BACK. THE MAXIMUM FINISH ELEVATION OF THE PARKING AREA ABOVE THE GUTTER LINE WILL VARY AND WILL BE DETERMINED ON A CASE BY CASE BASIS BY THE CITY ENGINEER.
4. REFERENCE THE CURRENT VERSION OF THE CITY'S COMPREHENSIVE TRANSPORTATION PLAN AND ENGINEERING DESIGN CRITERIA FOR ADDITIONAL INFORMATION AND DRIVEWAY REQUIREMENTS.

REQUIRED COMMERCIAL DRIVEWAY GRADES - ARTERIAL ST.

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

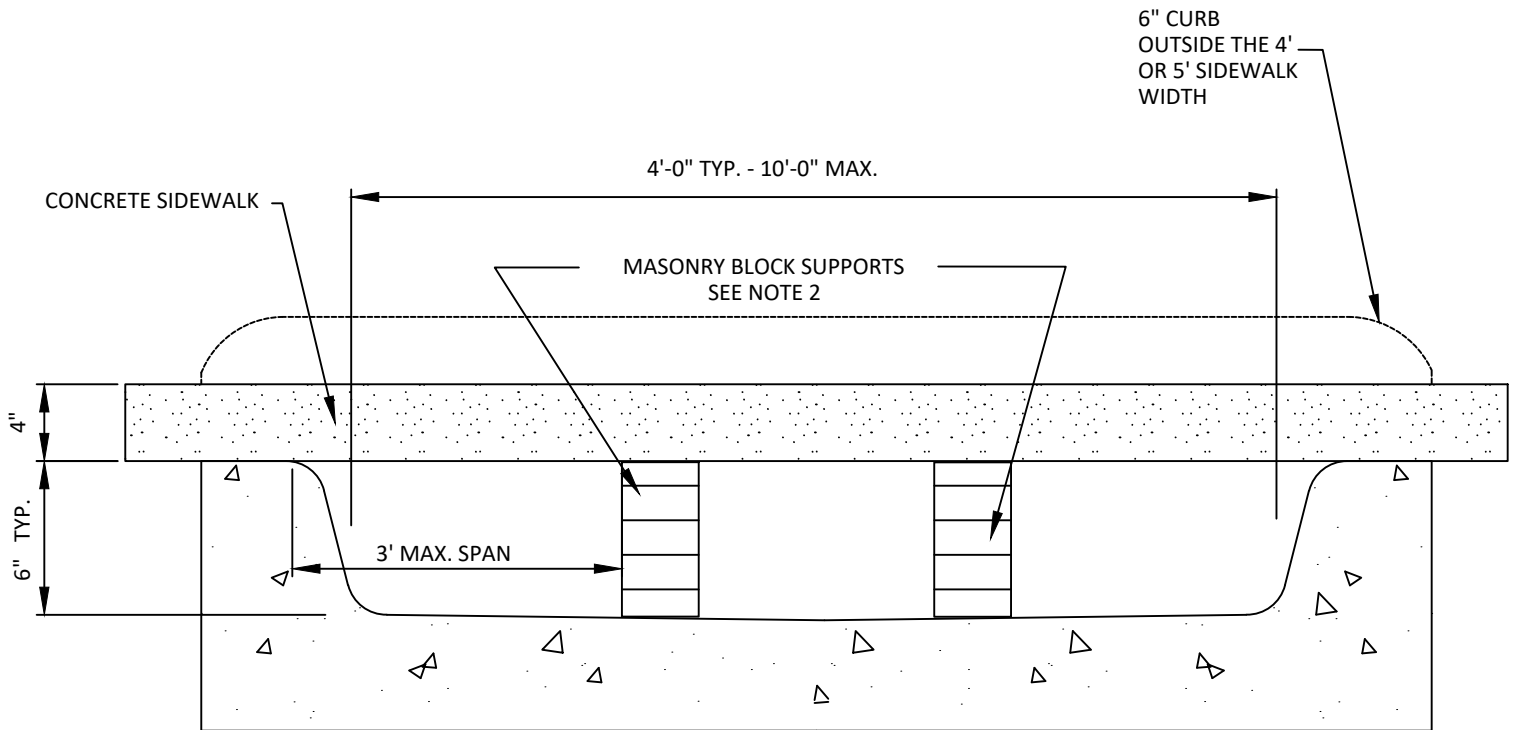
REVISION DATE: 01/2023

REV. NO.

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DRAWING NO.

ST 33



TYPICAL SECTION

NOTES

1. CROSS SLOPE OF SIDEWALK SHALL NOT EXCEED 2% IN ANY DIRECTION.
2. ONE MASONRY BLOCK SUPPORT SHALL BE REQUIRED FOR A FLUME 6 FT. WIDE OR LESS.
3. CONCRETE SUPPORTS MAY BE IN PLACE OF MASONRY BLOCKS IF APPROVED BY THE CITY ENGINEER.

SIDEWALK CROSSING CONCRETE FLUME

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

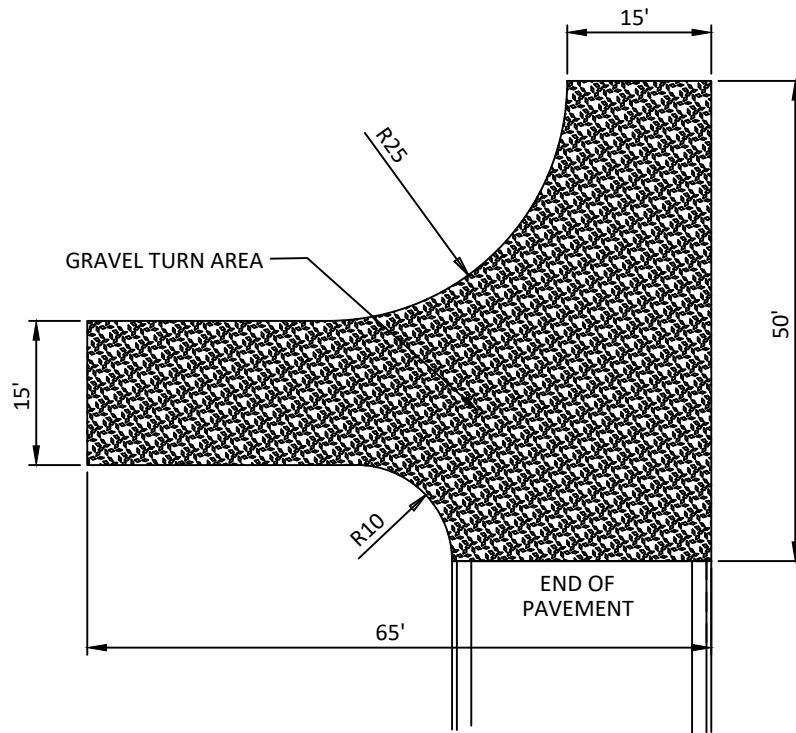
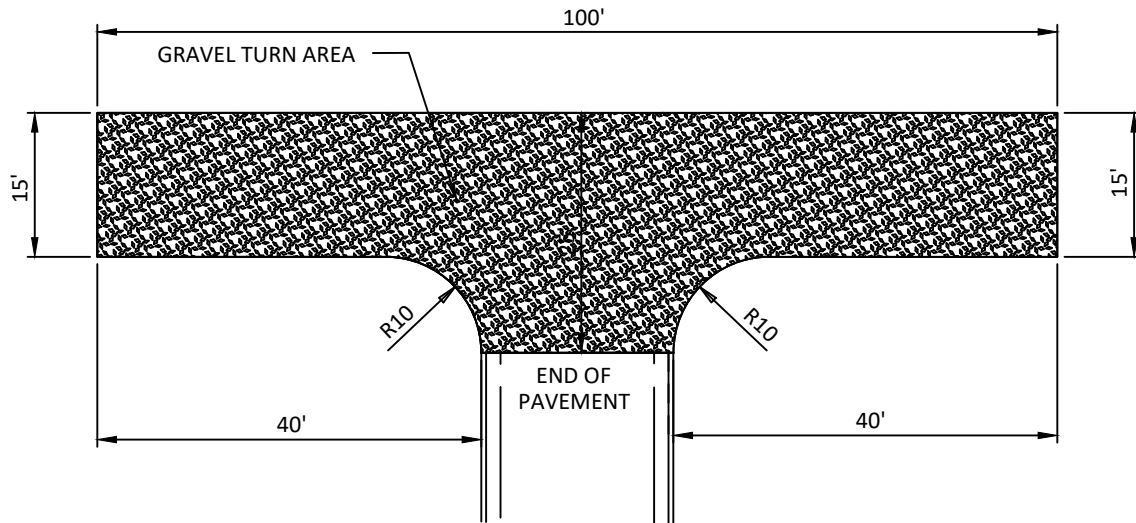
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TEMPORARY T TURN AROUND

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

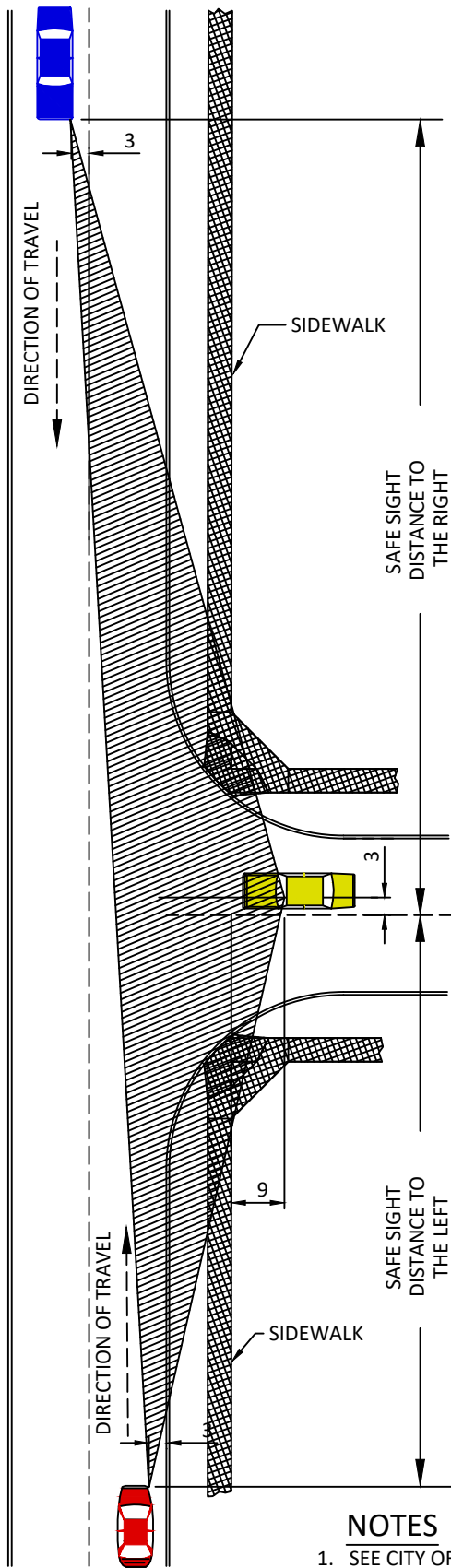
REVISION DATE: 01/2023

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DRAWING NO.

ST 35



THE INTERSECTION SIGHT DISTANCE PROVISIONS CONTAINED IN THE CURRENT VERSION OF "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS" PUBLISHED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (THE AASHTO GREEN BOOK REFERENCED IN SECTION 4006) ARE ADOPTED AS THE PRESUMPTIVE STANDARD APPLICABLE TO ALL INTERSECTIONS WITHIN THE CITY PROVIDED, HOWEVER, THAT DIRECTOR OF PUBLIC WORKS OR HIS DESIGNEE MAY, WHERE CONSISTENT WITH PUBLIC SAFETY, SPECIFY GREATER OR LESSER INTERSECTION SIGHT DISTANCES.

NOTES

1. SEE CITY OF NORMAN "STANDARD SPECIFICATIONS" SECTION 4007.2 SIGHT DISTANCE TRIANGLE (VISION TRIANGLE).

INTERSECTION SIGHT DISTANCE

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

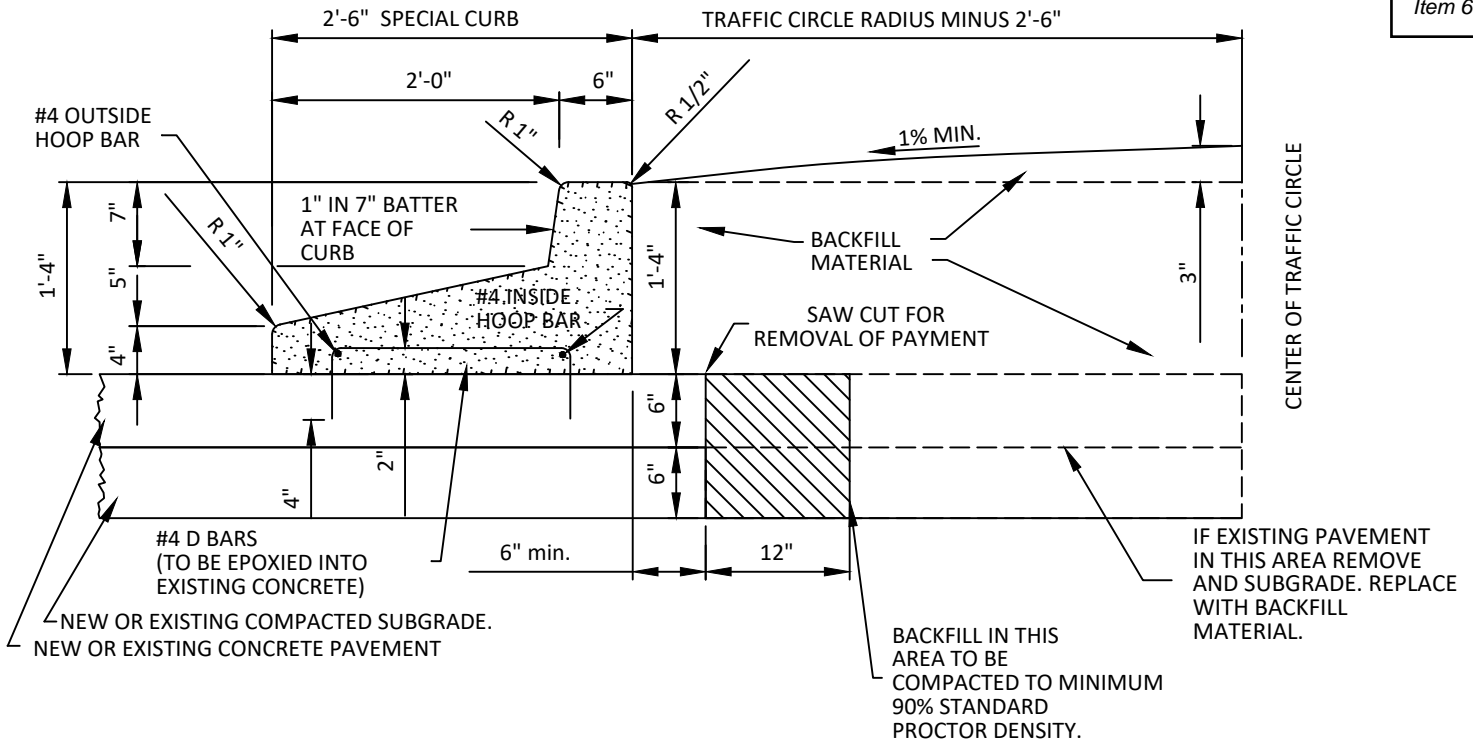
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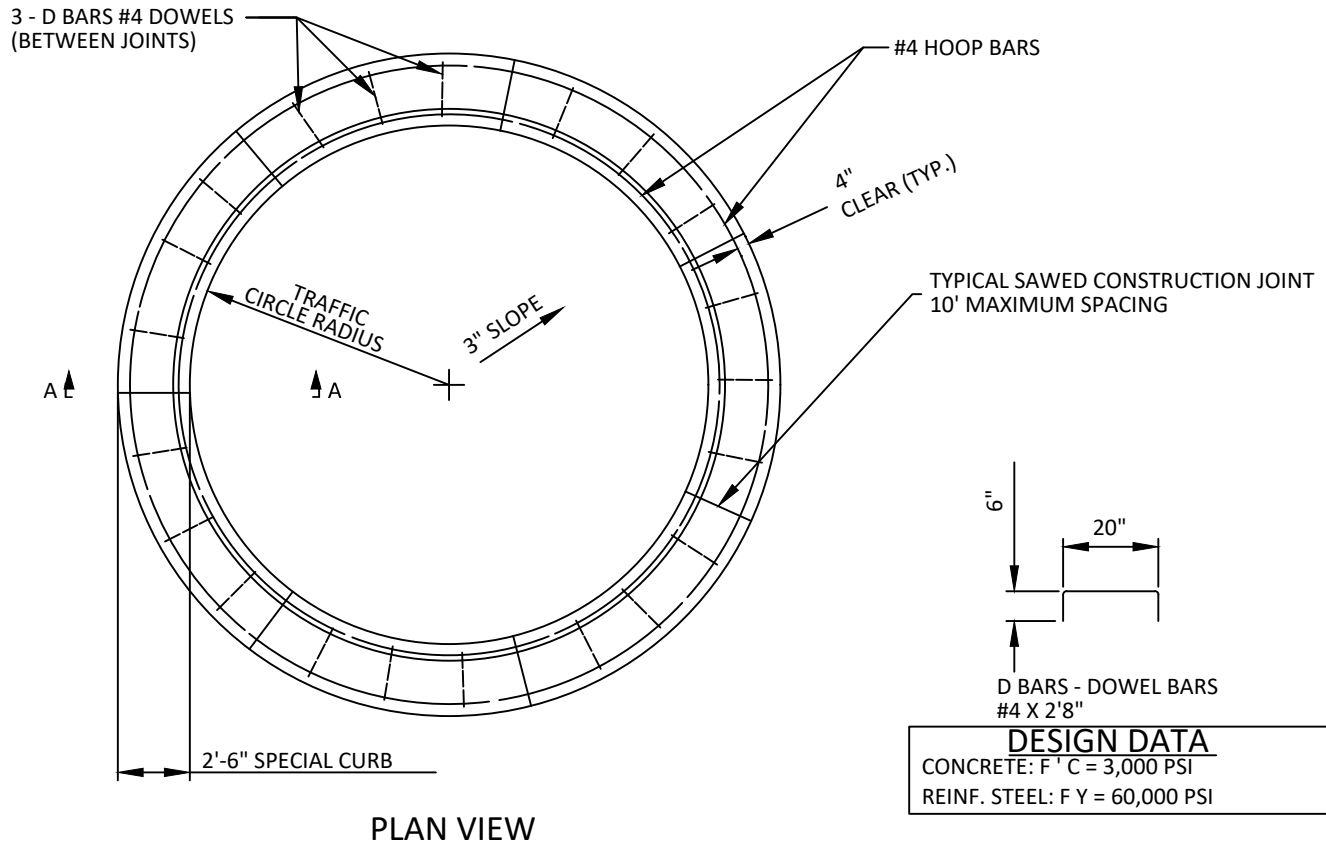
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SECTION A-A



PLAN VIEW

ROUNDBABOUT TRUCK APRON DETAIL - CONCRETE

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

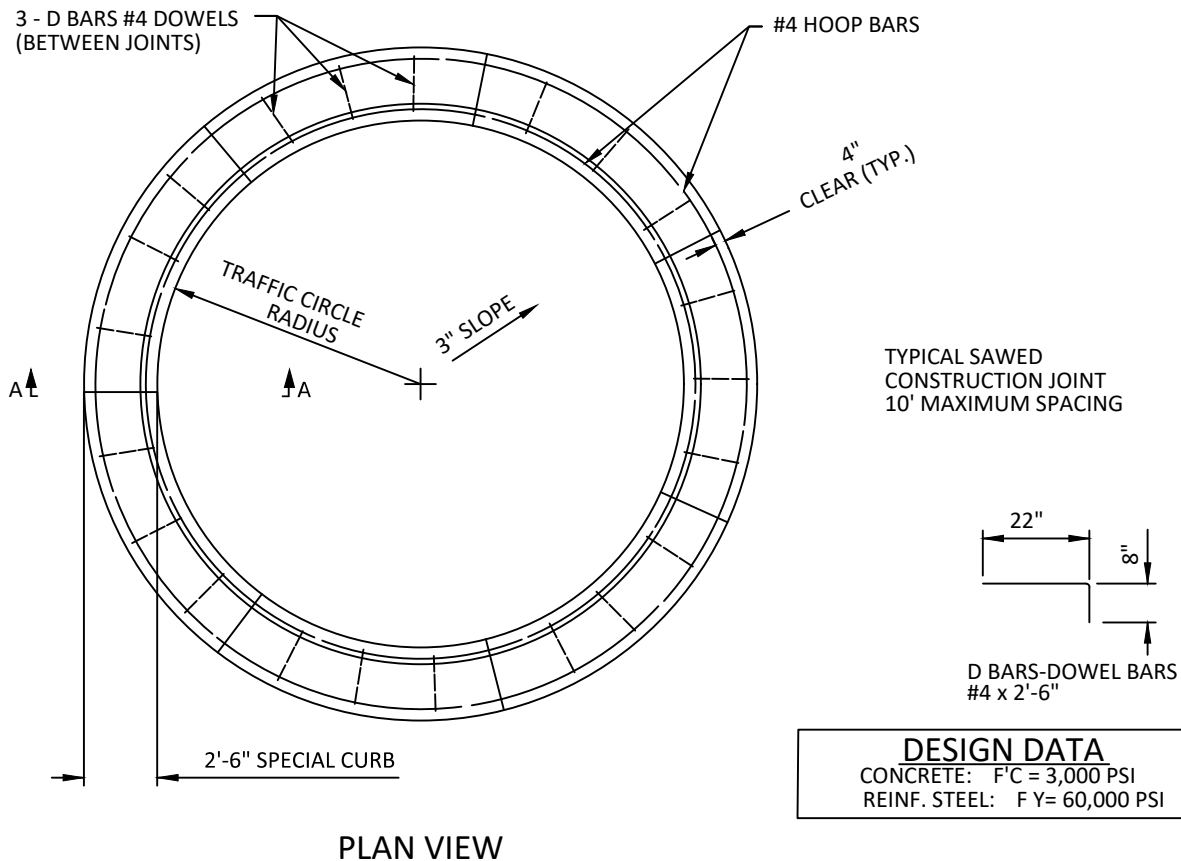
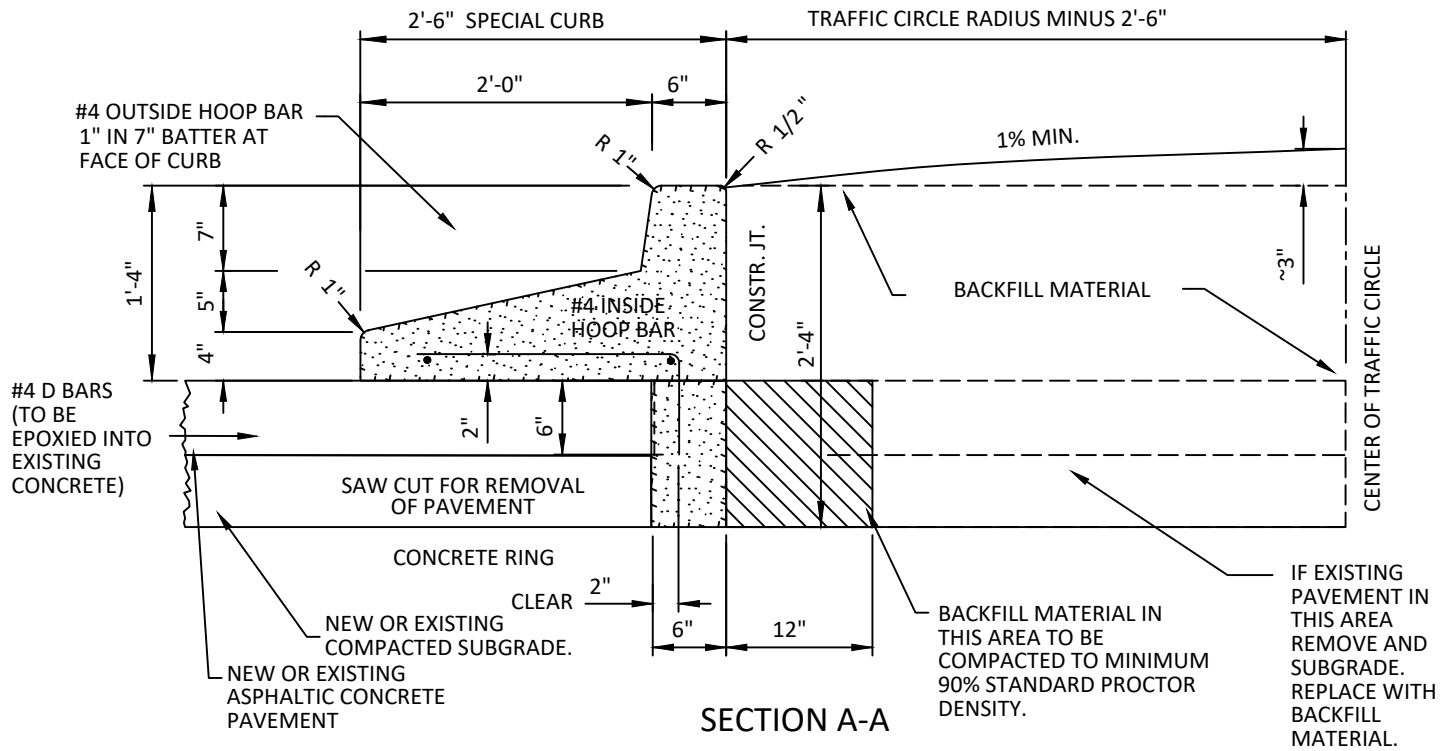
REVISION DATE: 01/2023

REV. NO.

1

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ST 38



ROUNDBOUT TRUCK APRON DETAIL - ASPHALT

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

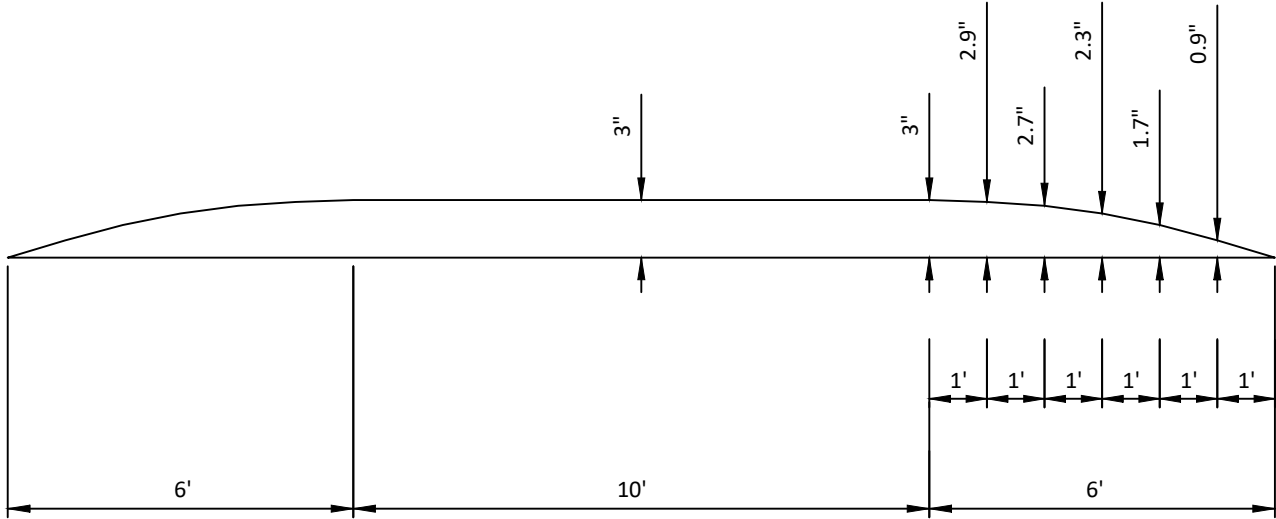
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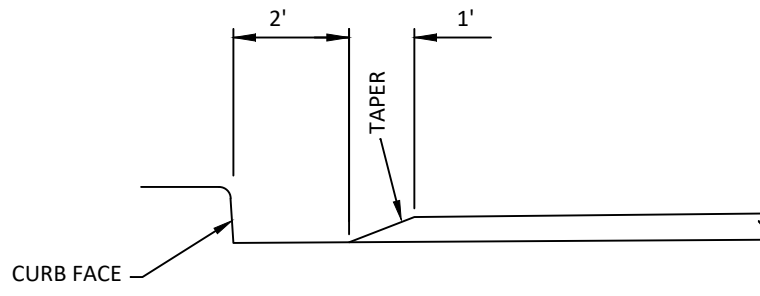
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DRAWING NO.

ST 39



LONGITUDINAL PROFILE


AT EDGE OF ROADWAY
(TRANSVERSE DIRECTION)

SPEED TABLE - 22' LONG

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

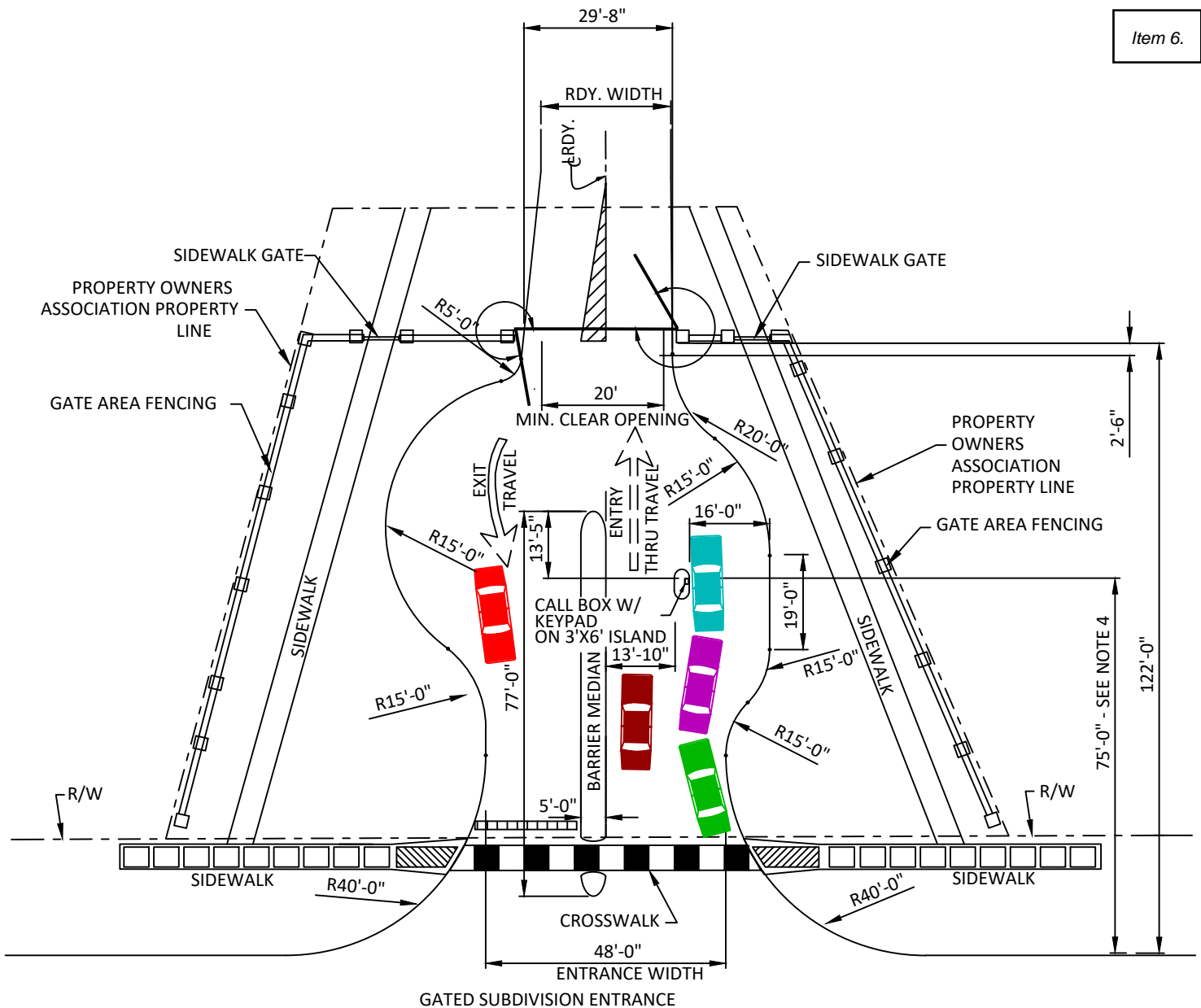
REVISION DATE: 01/2023

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ST 41



NOTES

(VEHICLE STACKING AT KEYPAD SHOWN)

1. A SIREN OPERATED SYSTEM (SOS) SHALL BE PROVIDED THAT WILL AUTOMATICALLY OPEN THE GATES UPON APPROACH OF EMERGENCY VEHICLES.
2. A MANUAL GATE RELEASE MECHANISM SHALL BE PROVIDED TO ALLOW A RESPONDER TO OPEN THE GATE UPON THE LOSS OF POWER TO THE GATE CONTROLS.
3. THERE MUST BE AT LEAST 20' CLEAR WIDTH GATE OPENING AND MINIMUM CLEAR HEIGHT OF 13'-6" TO ACCOMMODATE EMERGENCY VEHICLES.
4. MINIMUM QUEUING SPACE FOR GATED ENTRANCES INTERSECTING URBAN LOCAL AND COLLECTOR STREETS SHALL BE 50'. FOR GATED ENTRANCES INTERSECTING ARTERIAL AND RURAL COLLECTOR STREETS THE MINIMUM QUEUING SPACE SHALL BE 75' FOR DEVELOPMENTS WITH LESS THAN 100 LOTS. ADDITIONAL QUEUING SPACE MAY BE REQUIRED IF THE NUMBER OF LOTS SERVED BY THE THE GATED ENTRANCE EXCEEDS 100.
5. SWINGING GATES MUST OPEN IN THE DIRECTION OF NORMAL TRAFFIC FLOW AND MUST NOT IMPEDE PEDESTRIAN TRAFFIC OR TURNAROUND TRAFFIC WHILE OPENING OR WHEN IN THE OPEN POSITION.
6. GATES, FENCES, ETC. SHALL NOT INTERFERE WITH OR PREVENT ACCESS TO FIRE HYDRANTS. AREA AROUND HYDRANT(S) SHALL BE KEPT CLEAR OF OBSTRUCTIONS IN ACCORDANCE WITH CITY STANDARDS.
7. TURNAROUND AREA SHALL ACCOMMODATE A SINGLE UNIT TRUCK AS DESCRIBED IN STANDARD GC-04.
8. A "GATE HOUSE" MAY BE CONSTRUCTED USING CURRENT BUILDING CODES AND ENTRANCE, TRAVELED WAY LANES AND TURNAROUND AREA MUST BE MODIFIED TO ACCOMMODATE THE BUILDING.
9. ANY PROPOSED CHANGES SHALL BE REVIEWED AND APPROVED BY THE CITY ENGINEER, TRAFFIC ENGINEER AND THE FIRE MARSHAL'S OFFICE.

GATED ENTRANCE LAYOUT

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO.

1

DRAWING NO.

ST 42

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TABLE OF CONTENTS - STORMWATER

CITY ENGINEER APPROVAL:

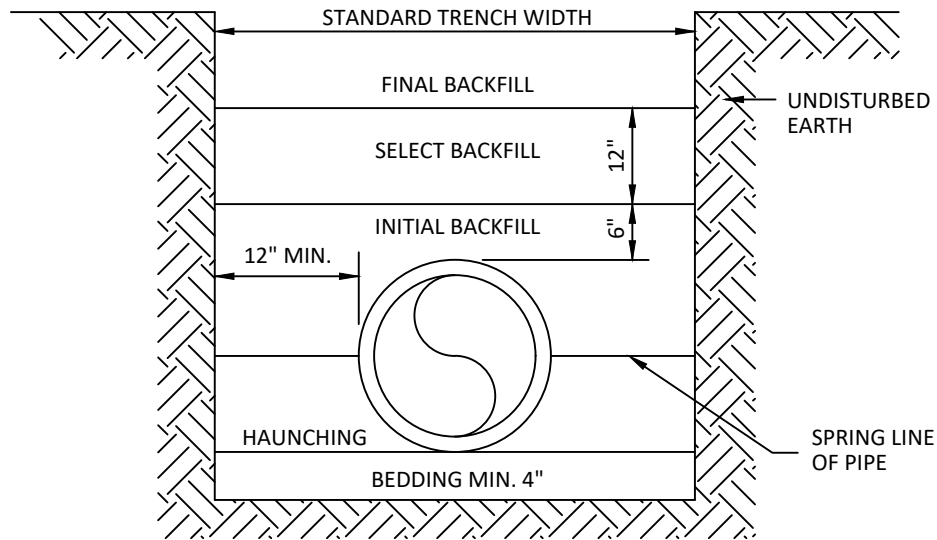
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 00

DRAWING NO. SD 00



BEDDING MATERIALS				
BACKFILL DESCRIPTION	NON-PAVED AREAS		PAVED AREAS (SEE NOTE 9)	
	CORRUGATED POLYPROPYLENE	CONCRETE	CORRUGATED POLYPROPYLENE	CONCRETE
FINAL BACKFILL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	SBM	SBM
SELECT BACKFILL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	SBM	SBM
INITIAL BACKFILL	SAND	SAND	SELECT FILL	SBM
HAUNCHING	SBM	SBM	SELECT FILL	SBM
BEDDING	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5

NOTES:

1. INSTALLATION AND BACK FILLING SHALL MEET MANUFACTURERS RECOMMENDATION.
2. SELECT FILL CONSISTS OF EXCAVATED MATERIALS CONTAINING NO MATERIAL LARGER THAN 2" DIAMETER.
3. STANDARD BEDDING MATERIAL (SBM) SHALL CONFORM TO ODOT 703.08, TYPE A, B, C, OR D AGGREGATE BASE OR CONTROLLED LOW-STRENGTH MATERIAL (CLSM) FILL PER SECTION 701.79.
4. COMPACTION REQUIREMENTS:
 - A. NON-PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY FOR COHESIONLESS SOILS AND 85% FOR COHESIVE SOILS.
 - B. PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY FOR COHESIONLESS SOILS.
5. IF TRENCH IS DRY, BEDDING SHALL BE 4" SAND OR TYPE A AGGREGATE BASE, AND IF WET SHALL BE NO. 57 OR NO.67 ROCK PER SECTION 701.06.
6. NO WATER JETTING ALLOWED.
7. IN SANDY NON-PAVED AREAS, SAND CAN BE USED FOR ALL BACKFILL.
8. FOR CONCRETE PIPES IN NON-PAVED AREAS, SAND CAN BE USED FOR ALL BACKFILL IF THE CONCRETE PIPE USES RUBBER O-RING JOINTS.
9. THE BACKFILL MATERIAL SHALL EXTEND A MINIMUM OF 2' BEHIND THE BACK OF THE CURB, OR THE EDGE OF PAVEMENT WHERE NO CURB EXISTS.
10. POLYPROPYLENE PIPE CAN ONLY BE USED OUTSIDE OF THE ROADWAY LIMITS OR PERPENDICULAR TO THE TRAVEL WAY FOR CROSSING.

STORM SEWER PIPE TRENCHING AND BEDDING

CITY ENGINEER APPROVAL:

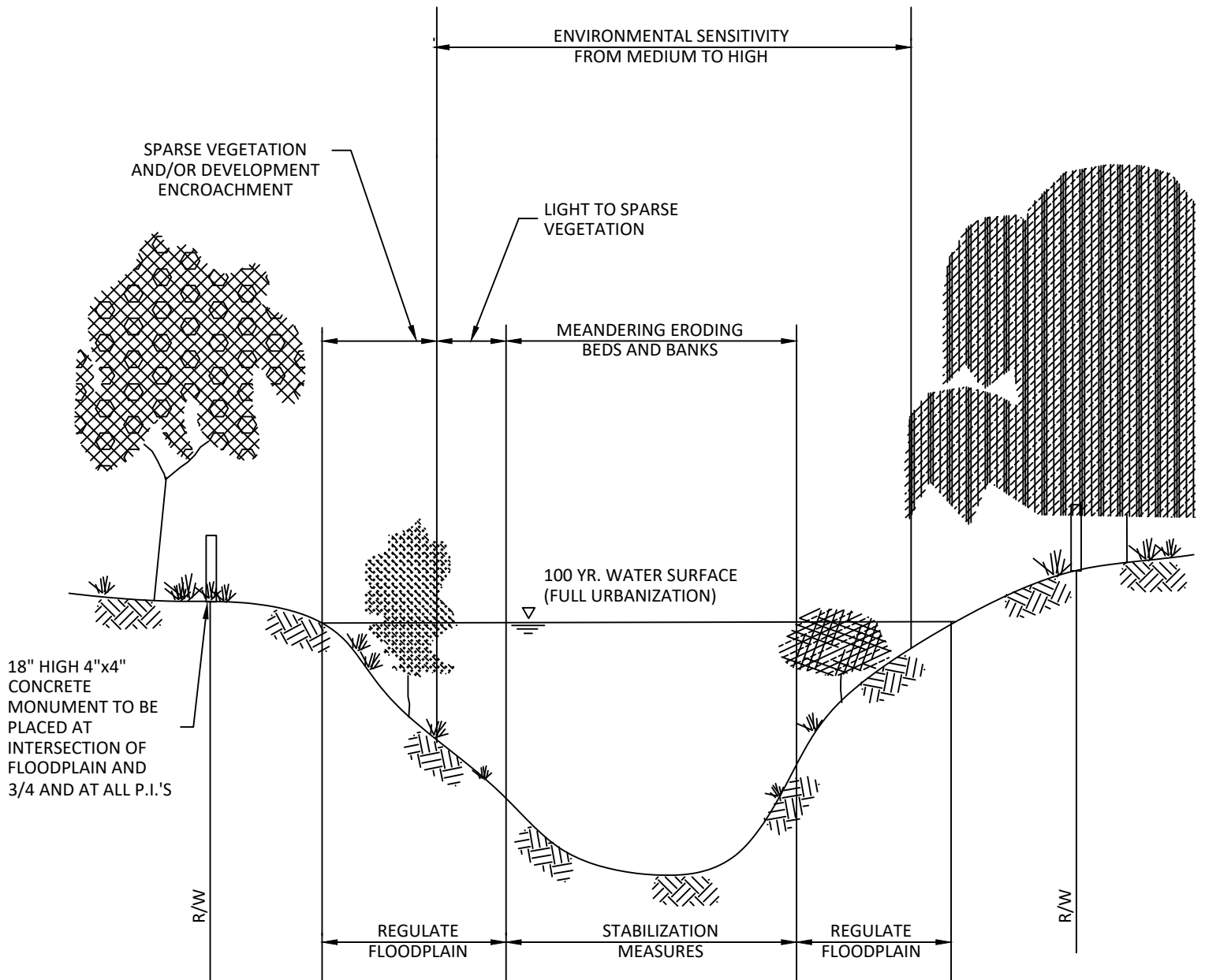
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 06

DRAWING NO. SD 01



NOTES:

1. STABILIZATION MEASURES INCLUDE CHECK STRUCTURES, RIPRAP, MINOR GRADING, SHORT SECTIONS OF RETAINING WALLS.
2. GENERALLY LITTLE OR NO CAPACITY IMPROVEMENTS ARE INCLUDED - ONLY STABILIZATION AND FLOODPLAIN REGULATIONS.
3. ALL BRUSH AND TREES UNDER 4" DIAMETER MAY BE REMOVED.
4. WHERE FLOODPLAIN IS LESS THAN 150' THE R.O.W. REQUIRED SHALL BE THE FLOODPLAIN WIDTH PLUS 15' (MIN.) EACH SIDE OF FLOODPLAIN FOR MAINTENANCE ACCESS.

NATURAL CHANNEL

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

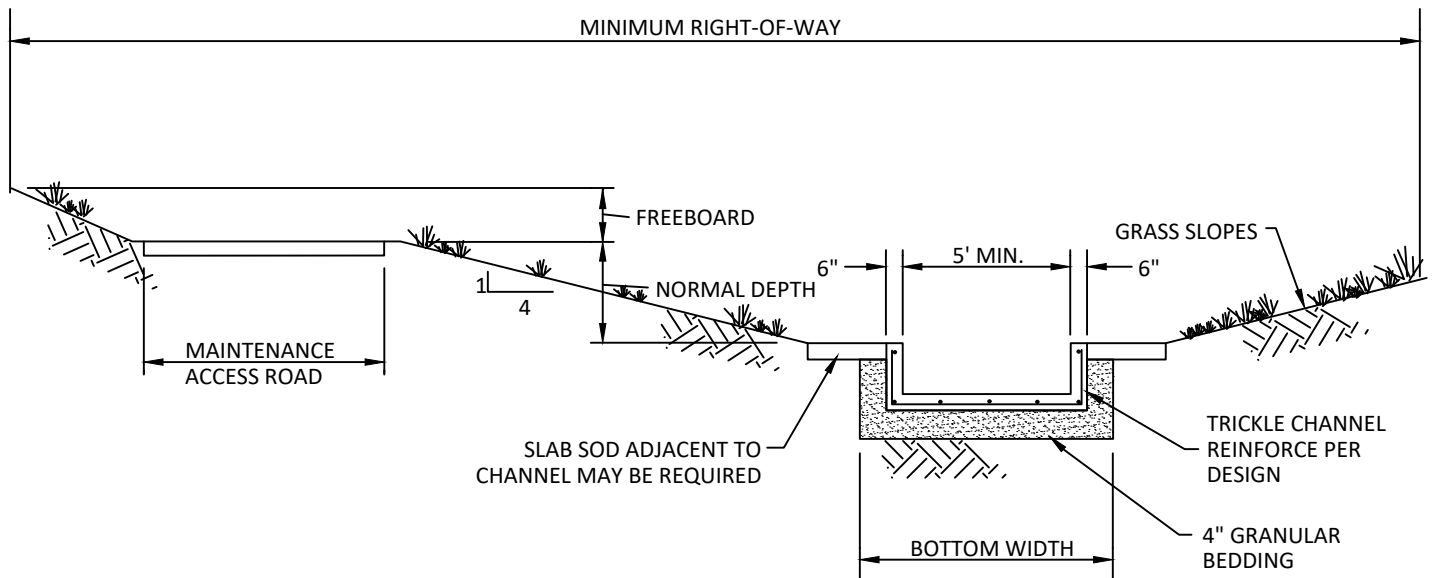
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. SD 02

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**NOTES:**

1. BOTTOM WIDTH: CONSISTENT WITH MAXIMUM ALLOWABLE DEPTH AND VELOCITY REQUIREMENTS. SHALL NOT BE LESS THAN TRICKLE CHANNEL WIDTH.
2. TRICKLE CHANNEL: MINIMUM CAPACITY TO BE 1% TO 3% OF 100 YEAR FLOW, BUT NOT LESS THAN 1 CFS. CHANNEL TO BE CONSTRUCTED OF CONCRETE OR OTHER APPROVED MATERIALS.
3. FREEBOARD: FREEBOARD TO BE 1' MINIMUM.
4. MAINTENANCE/ACCESS ROAD: MINIMUM WIDTH TO BE 10'.
5. R/W WIDTH: MINIMUM WIDTH TO INCLUDE FREEBOARD AND MAINTENANCE ACCESS ROAD.
6. CHANNEL SIDE SLOPE: MAXIMUM SIDE SLOPE FOR GRASS-LINED CHANNELS TO BE 4:1.
7. THE MAXIMUM FLOW VELOCITY TO BE 7 FPS FOR EROSION RESISTANT SOILS OR 5 FPS FOR SANDY SOILS.

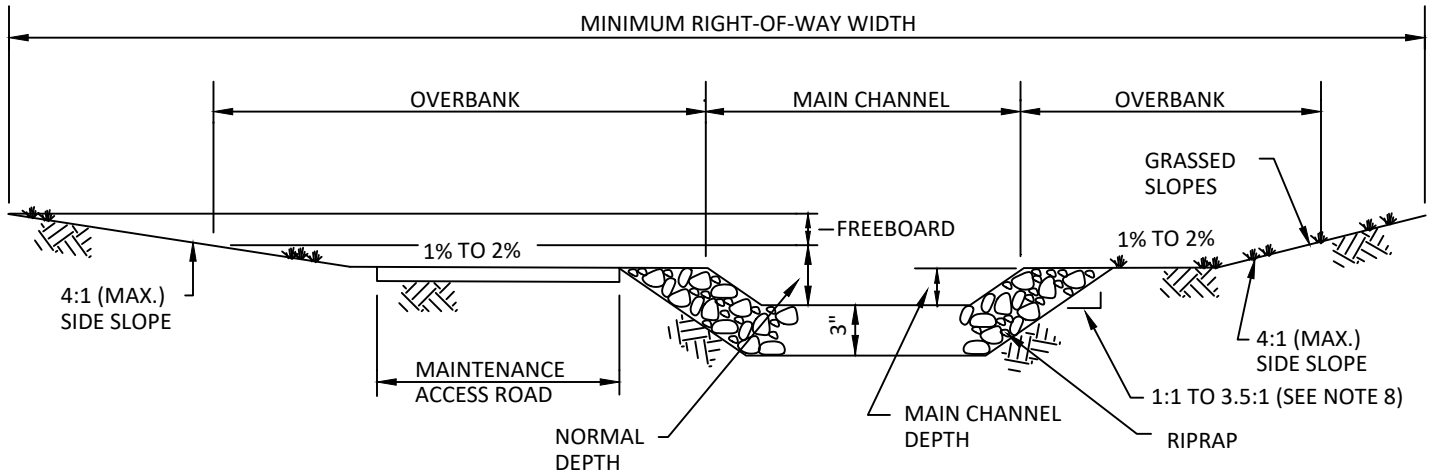
GRASS LINED CHANNEL, TYPE A

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: **01/2023**REV. NO. **01**DRAWING NO. **SD 03**



NOTES:

1. THIS SECTION IS REQUIRED FOR CHANNELS WITH SANDY SOILS.
2. MAIN CHANNEL: CAPACITY TO BE FROM 2 YEAR TO THE 5 YEAR. MAXIMUM VELOCITIES IN CHANNELS SHALL BE BASED ON ALLOWABLE SHEAR STRESS FOR CHANNEL LINING. IF RIPRAP IS USED, USE A MANNINGS N VALUE OF .03 FOR HYDRAULIC CALCULATIONS.
3. NORMAL DEPTH: FLOW DEPTH FOR 100 YEAR FLOW SHALL NOT EXCEED 5', NOT INCLUDING THE MAIN CHANNEL DEPTH.
4. FREEBOARD: FREEBOARD TO BE A MINIMUM OF 1'.
5. MAINTENANCE/ACCESS ROADS: MINIMUM WIDTH TO BE 10'. COUNTY MAY REQUIRE ALL OR PART OF THE ROAD TO BE SURFACED.
6. R/W WIDTH: MINIMUM WIDTH TO INCLUDE FREEBOARD AND MAINTENANCE/ACCESS ROAD.
7. OVERBANK: FLOW IN EXCESS OF MAIN CHANNEL TO BE CARRIED IN THIS AREA. AREA MAY BE USED FOR RECREATIONAL PURPOSES.
8. FOR TRAPEZOIDAL CHANNELS, THE MINIMUM BOTTOM WIDTH SHALL BE 4' WITH SIDE SLOPES OF NO STEEPER THAN 3.5:1 FOR SODDED SECTIONS AND A MINIMUM BOTTOM WIDTH OF 3' WITH SIDE SLOPES OF NO STEEPER THAN 1:1 FOR PAVED OR ROCK-LINED SECTIONS.

GRASSED LINED CHANNEL, TYPE B

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

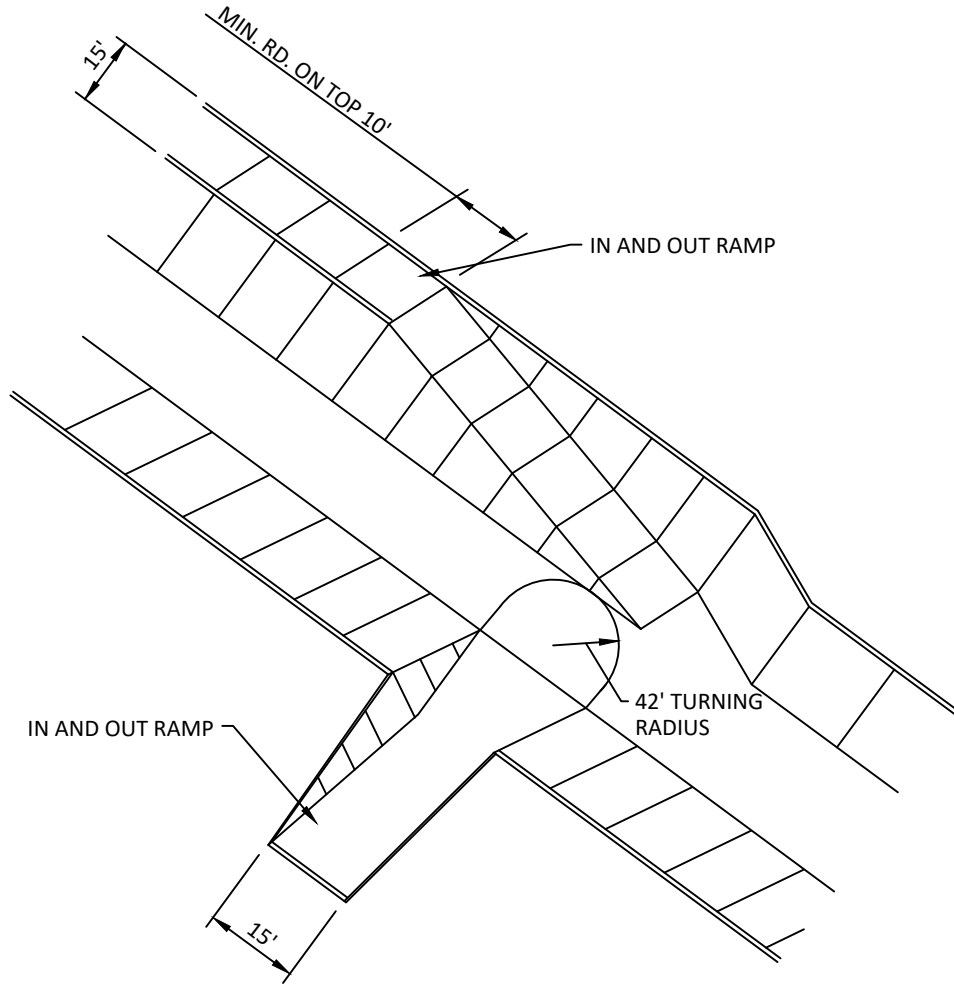
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. SD 04

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NOTES:

1. ALL RAMPS SHALL HAVE A MAXIMUM SLOPE OF 4:1 WITH 1" CORRUGATIONS IN ROADWAY.
2. MAXIMUM SPACING ON RAMPS SHALL BE 600' WITH A MINIMUM OF 2 RAMPS BETWEEN RESTRICTIVE STRUCTURES.
3. ALL RAMPS ARE TO BE FENCED AND LOCKED. GATE LOCKS TO BE FURNISHED BY THE CITY.
4. MINIMUM TURNING RADIUS AT THE OUTSIDE WHEEL SHALL BE 42' FOR ENTRANCE AND EXIT.

RAMP FOR CONCRETE LINED CHANNEL

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

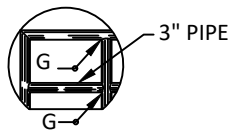
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

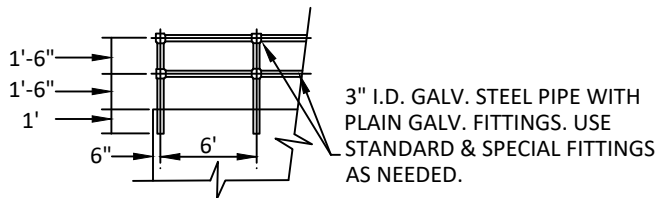
DRAWING NO. SD 05

371

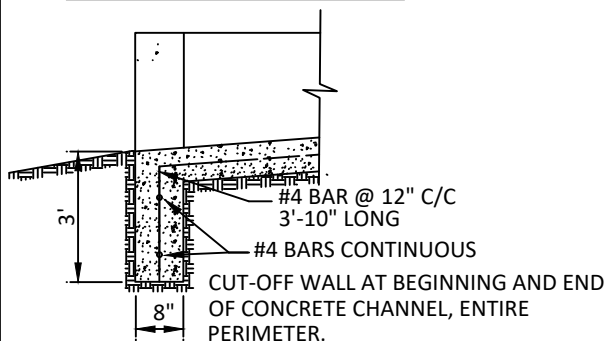


ALTERNATE DETAIL

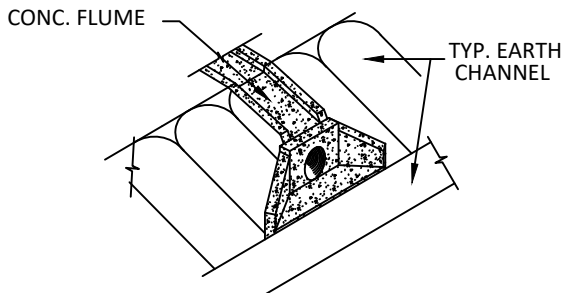
(USING WELDED CONNECTIONS PIPE HANDRAIL)



PIPE HANDRAIL DETAIL

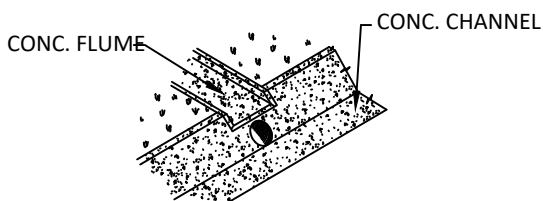


CUT-OFF WALL DETAIL



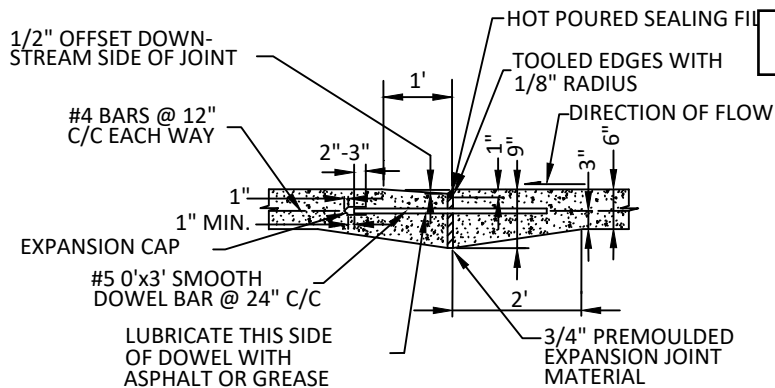
VIEW OF FLUME

AT EARTH CHANNEL



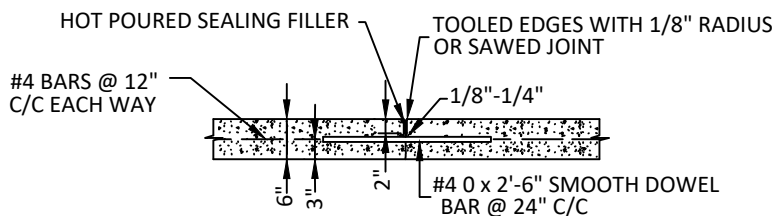
VIEW OF FLUME

AT CONCRETE CHANNEL



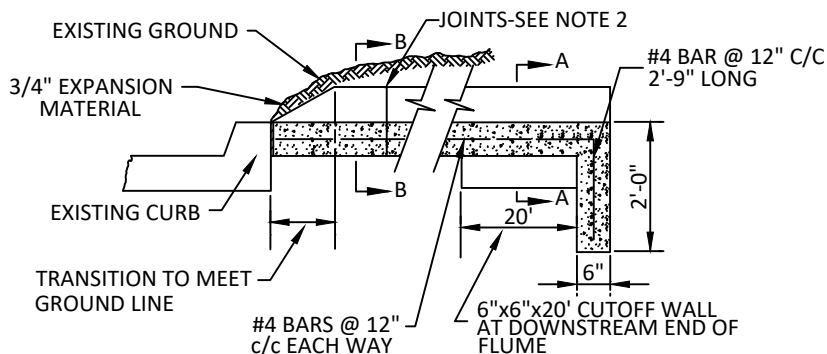
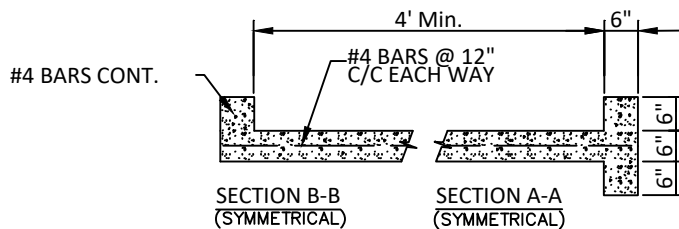
TYPICAL TRANSVERSE EXPANSION JOINT

SPACED AT 100 FOOT C/C MAX.



TRANSVERSE DUMMY GROOVE CONTRACTION JOINT

SPACED AT 20 FOOT C/C



PROFILE

NOTES:

- HANDRAIL WELDED CONNECTIONS MAY BE USED FOR PIPE HANDRAIL. WELDED CONNECTIONS SHALL BE THOROUGHLY CLEANED OF ALL LOOSE SCALE, GROUND SMOOTH & SPOT PAINTED WITH TWO COATS OF ALUMINUM PAINT.
- 3/4" EXPANSION JOINT @ 100' MAX. SAWED CONT. JOINT @ 20' MAX.

FLUME & CHANNEL LINER DETAILS

CITY ENGINEER APPROVAL:

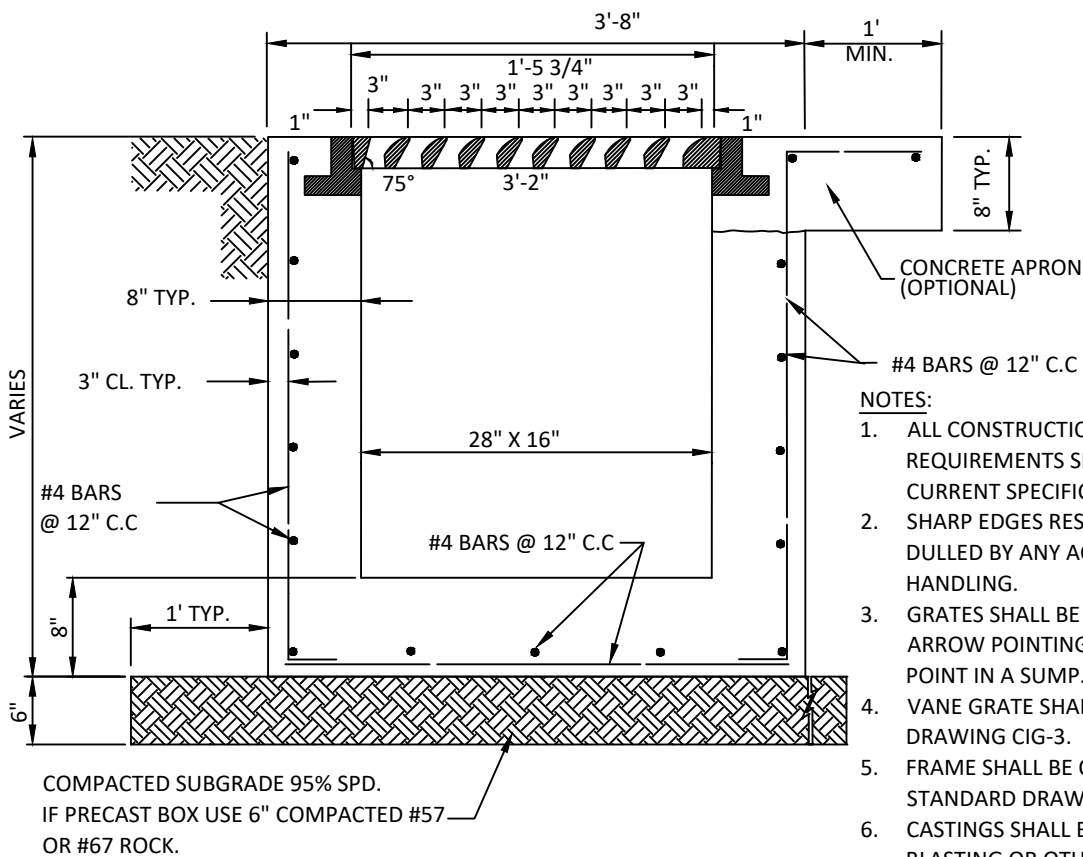
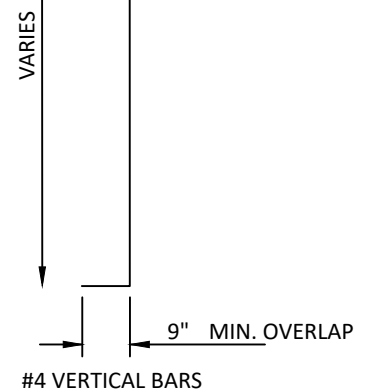
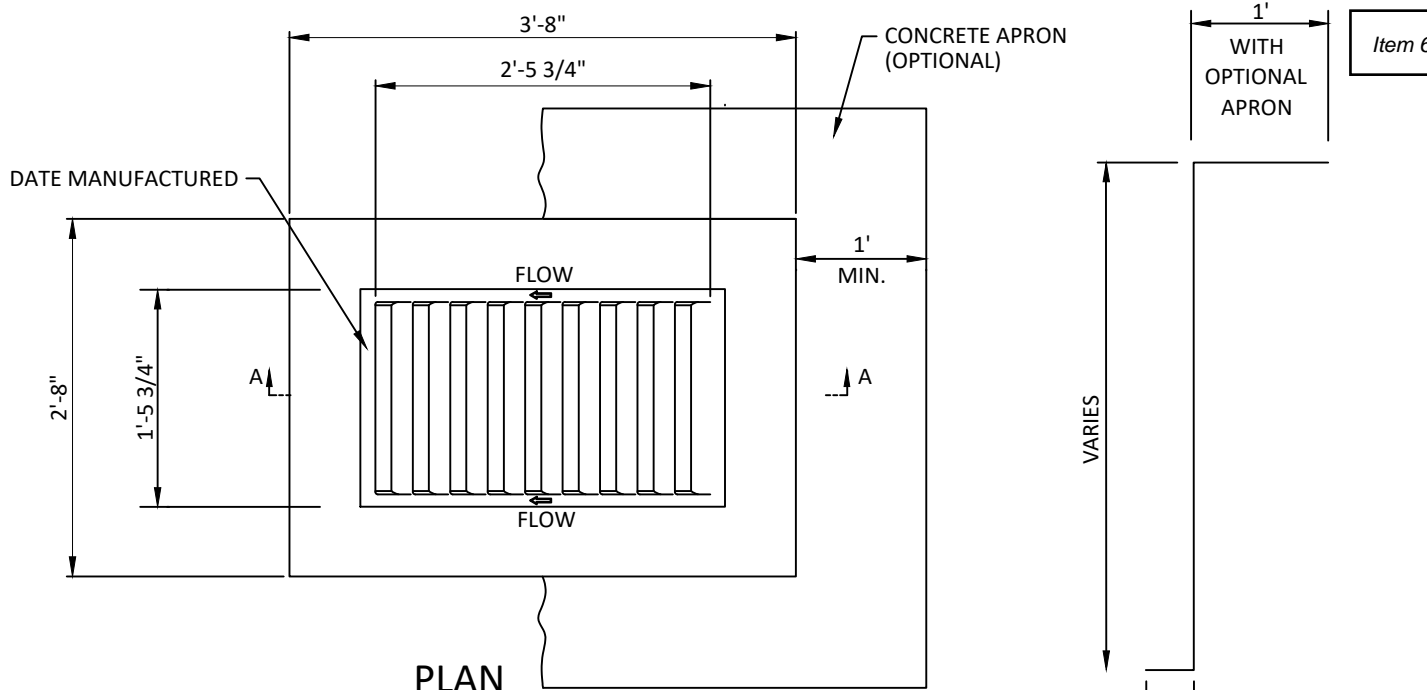
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. SD 07



NOTES:

1. ALL CONSTRUCTION METHODS & MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE CURRENT SPECIFICATIONS.
2. SHARP EDGES RESULTING FROM FABRICATION SHALL BE DULLED BY ANY ACCEPTABLE METHOD FOR SAFETY IN HANDLING.
3. GRATES SHALL BE INSTALLED IN FRAME WITH FLOW ARROW POINTING DOWNSTREAM OR TOWARD THE LOW POINT IN A SUMP.
4. VANE GRATE SHALL BE ODOT TYPE VG-F, STANDARD DRAWING CIG-3.
5. FRAME SHALL BE ODOT TYPE A FOR INLET DESIGN 1, STANDARD DRAWING SSIF-4.
6. CASTINGS SHALL BE SMOOTH AND WELL CLEANED BY SHOT BLASTING OR OTHER APPROVED CLEANING.
7. ALL CASTINGS SHALL BE MANUFACTURED TRUE TO PATTERN; COMPONENT PARTS SHALL FIT TOGETHER IN A SATISFACTORY MANNER.
8. ALL LETTERING SHALL BE RECESSED 1/16".

AREA INLET

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

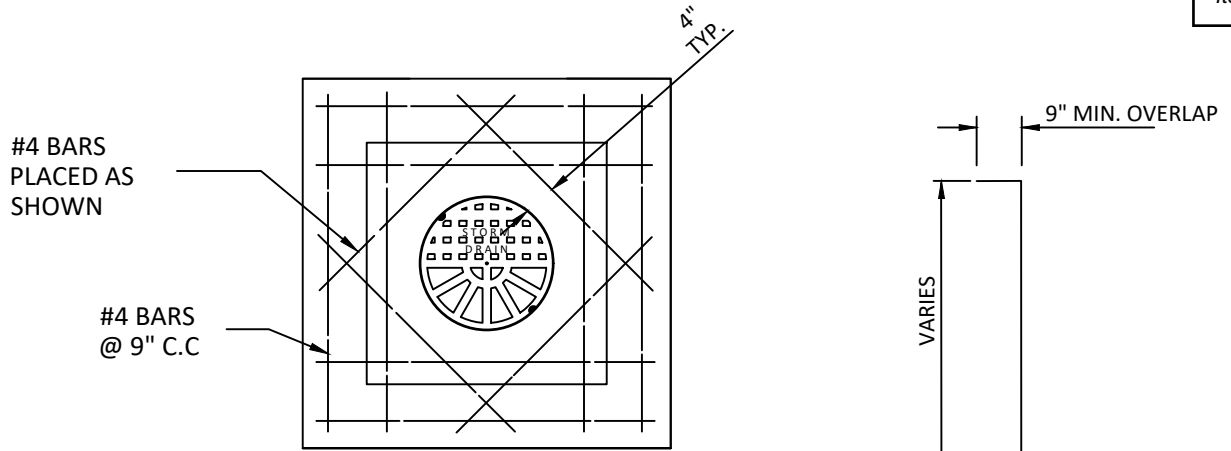
REVISION DATE: 01/2023

REV. NO. 02

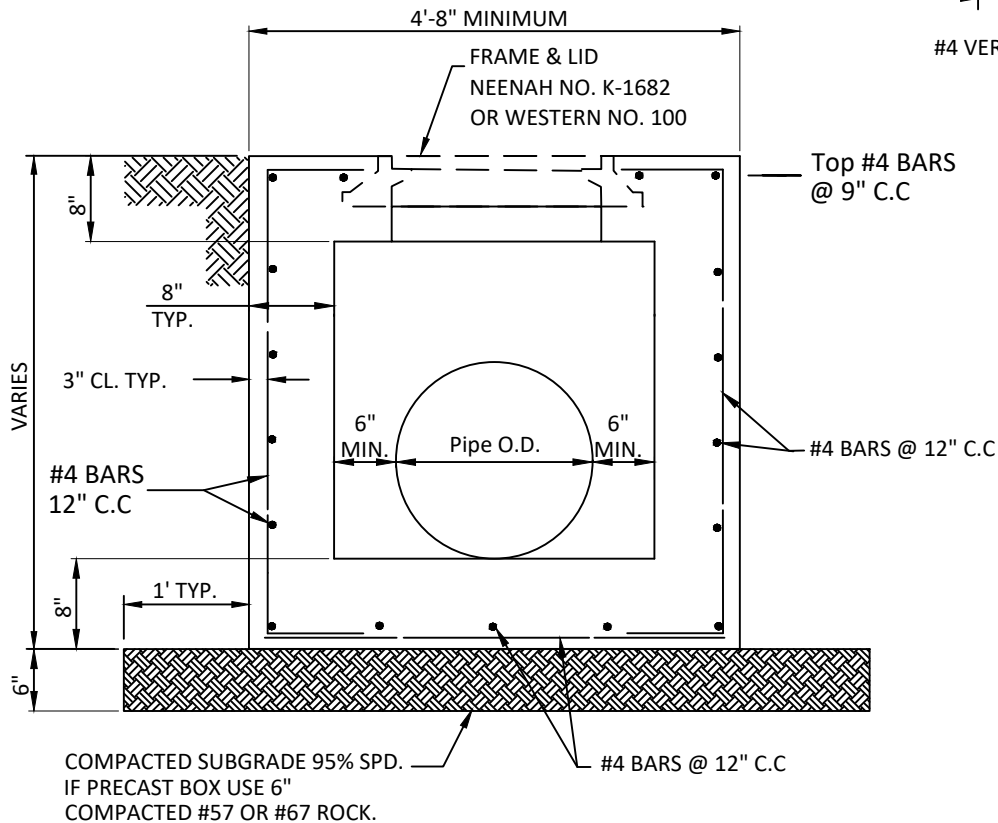
DRAWING NO. SD 08

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Item 6.



TYPICAL SECTION AT TOP OF BOX



TYPICAL SECTION THRU JUNCTION BOX

NOTES:

1. ALL CONSTRUCTION METHODS & MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE CURRENT SPECIFICATIONS.
2. ALL LETTERING SHALL BE RECESSED 1/16".

JUNCTION BOX DETAIL

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

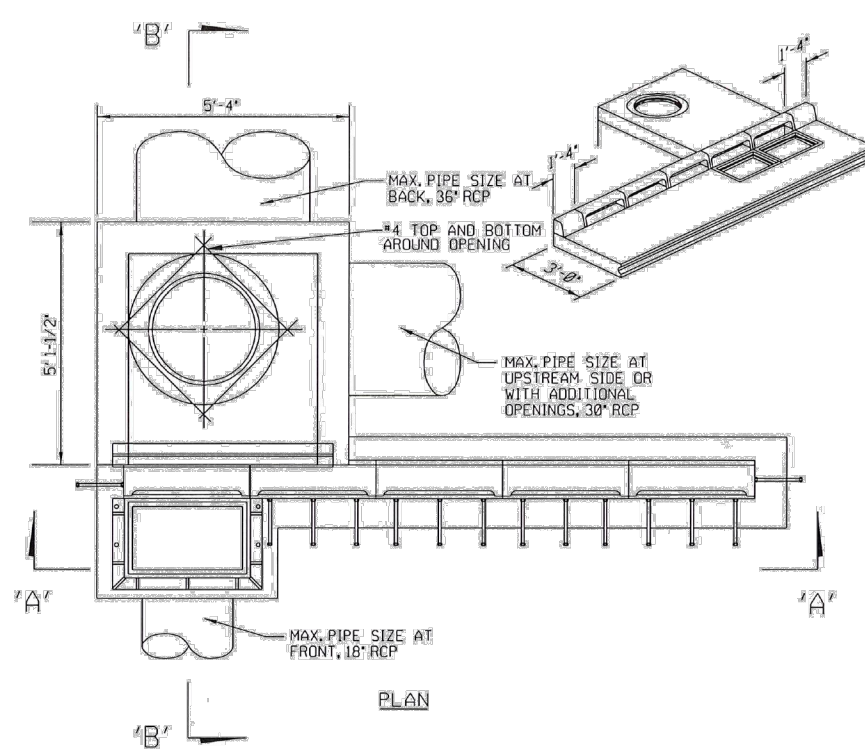
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375

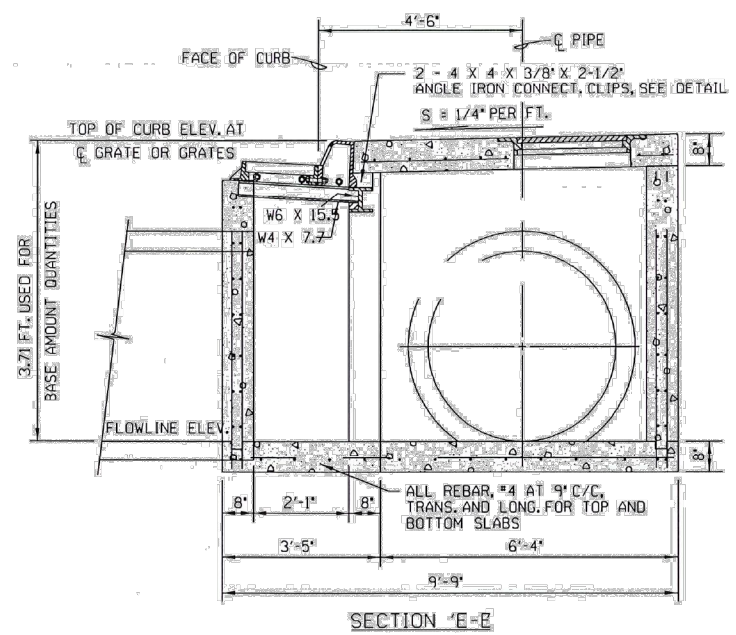
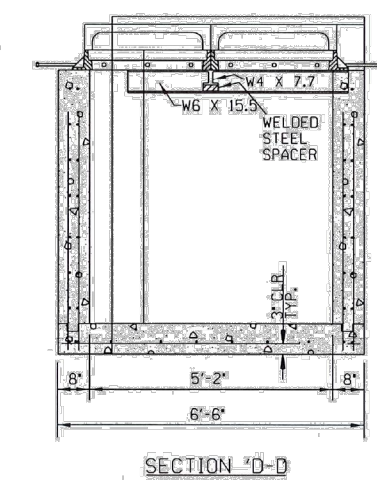
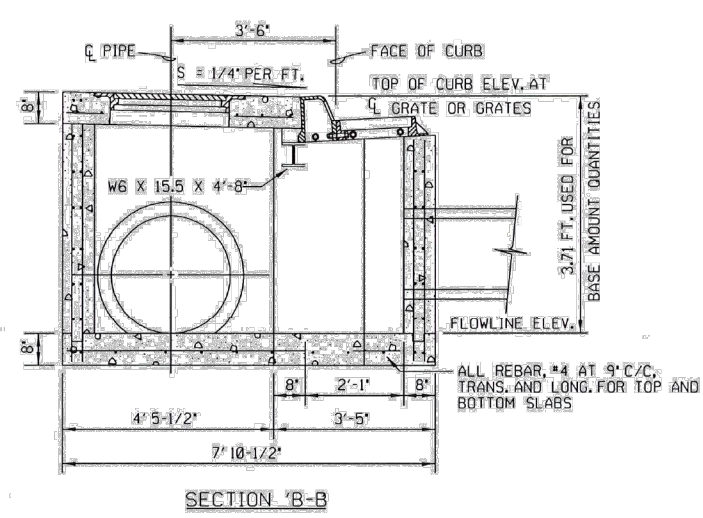
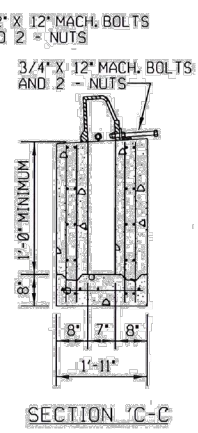
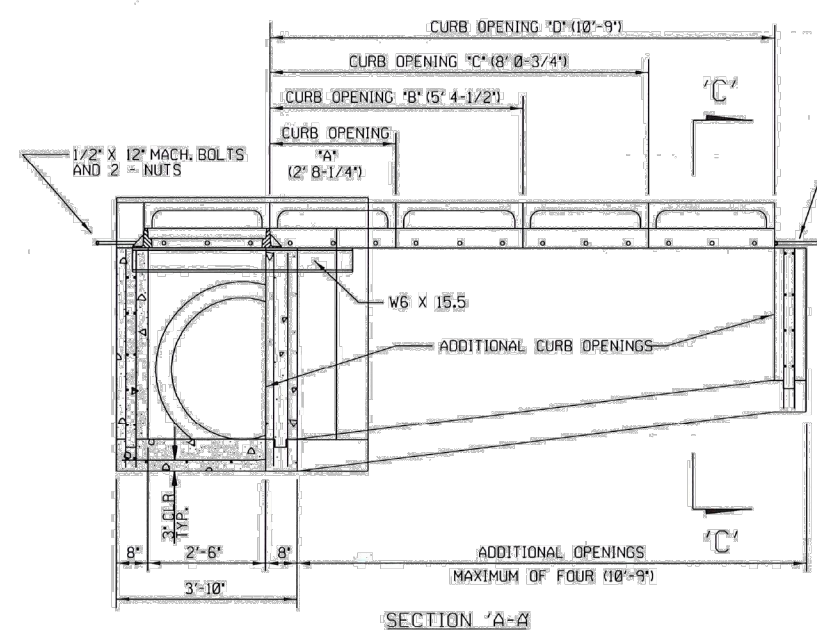
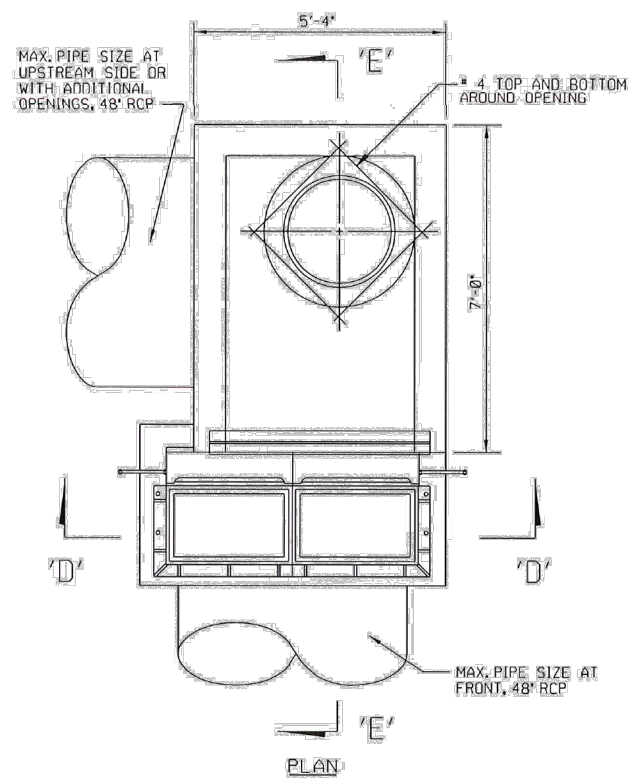


- # CONCRETE VALLEY GUTTER DETAIL

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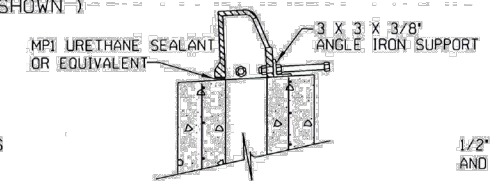


QUANTITIES FOR INLETS							
INLET	CURB OPENING	CLASS 'A' CONCRETE	INLET		INLET FRAME AND GRATE	CAST IRON CURB INLET	MH FRAME AND COVER
DESIGN	DESIGNATION	CU. YD.	BASE AM'T.	ADD'L. C.F. PER VERT. FT.	EACH	EACH	EACH
1 WITH SMALL JUNCT. BOX	'A'	1.50	43.56	15.84	1	1	1
	'B'	1.60	47.34	17.43	1	2	1
	'C'	1.73	55.44	21.03	1	3	1
	'D'	1.86	62.26	24.63	1	4	1
2 WITH SMALL JUNCT. BOX	'A'	1.99	68.03	28.23	1	5	1
	'B'	1.70	47.84	17.40	2	2	1
	'C'	1.83	57.01	21.00	2	3	1
	'D'	1.96	64.86	24.60	2	4	1
1 WITH LARGE JUNCT. BOX	'A'	2.08	71.70	28.20	2	5	1
	'B'	2.21	77.28	31.80	2	6	1
	'C'	2.11	50.44	18.34	1	1	1
	'D'	2.21	54.22	19.93	1	2	1
2 WITH LARGE JUNCT. BOX	'A'	2.34	62.32	23.53	1	3	1
	'B'	2.47	69.14	27.13	1	4	1
	'C'	2.60	74.91	30.73	1	5	1
	'D'	2.31	54.72	19.90	2	2	1
	'A'	2.43	63.89	23.50	2	3	1
	'B'	2.57	71.74	27.10	2	4	1
	'C'	2.69	78.58	30.70	2	5	1
	'D'	2.82	84.16	34.30	2	6	1

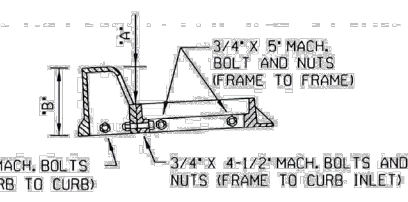


SINGLE GRATE CURB INLET WITH JUNCTION BOX
(DESIGN 1-D WITH SMALL JUNCTION BOX SHOWN)

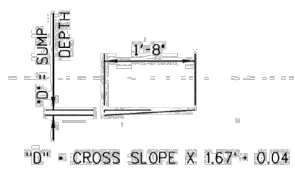
ALL REBAR IN WALLS
4 @ 12" CTRS. EA WAY
(TYPICAL)



ADDITIONAL CURB OPENING DETAILS

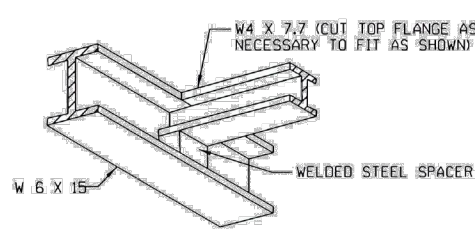


FRAME AND CURB DETAILS



DOUBLE GRATE CURB INLET WITH JUNCTION BOX
(DESIGN 2 WITH LARGE JUNCTION BOX SHOWN)

18" THRU 30" LONGITUDINAL PIPE REQUIRES SMALL JUNCTION BOX
ALL REBAR IN WALLS # 4 @ 12" CTRS. EA WAY (TYPICAL)



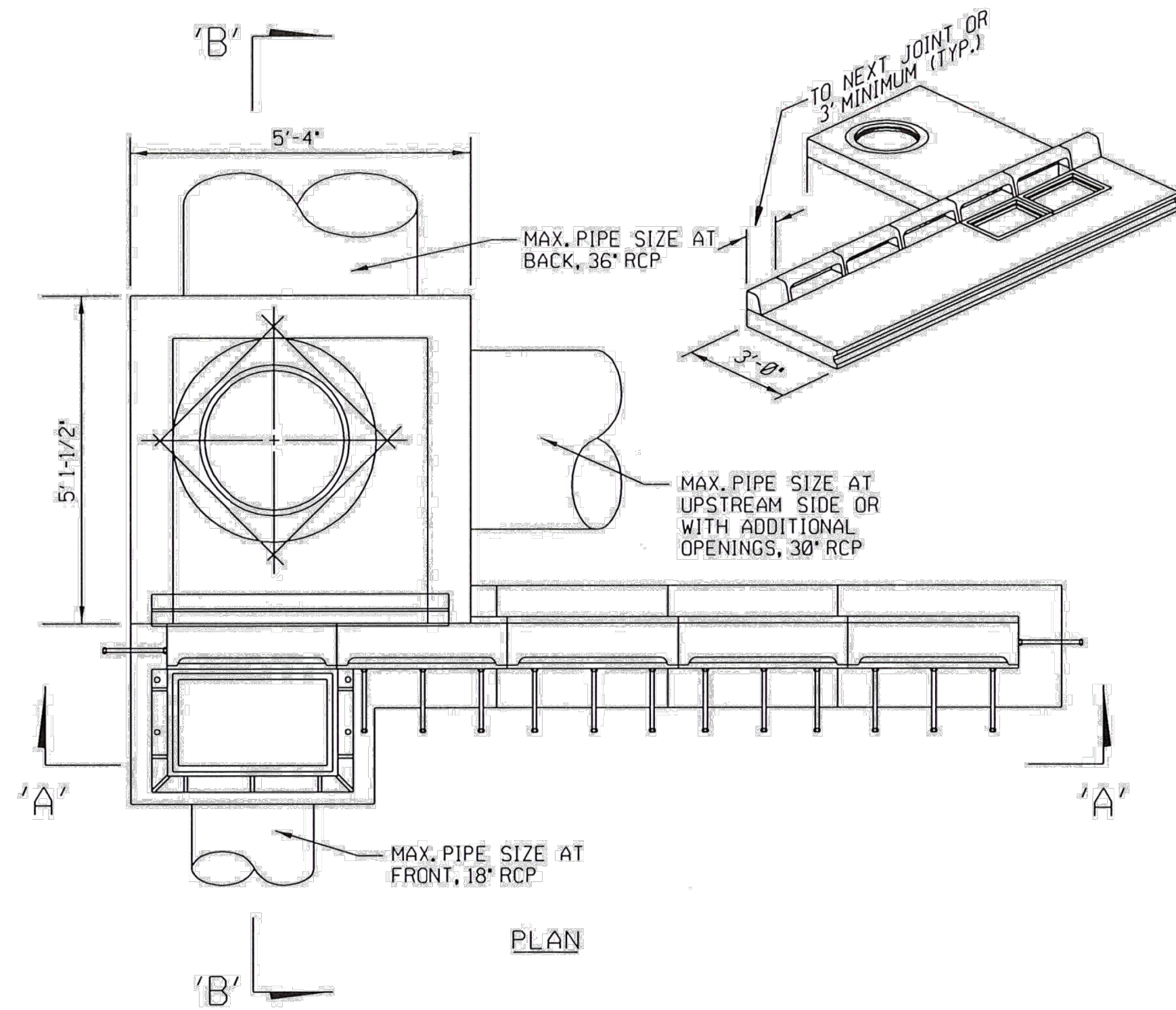
I-BEAM CONNECTION DETAIL FOR DOUBLE GRATE

ANGLE IRON LENGTHS	
OPENING	LENGTH
'A'	2'-5-3/8"
'B'	5'-1-5/8"
'C'	7'-9-7/8"
'D'	10'-6-1/8"

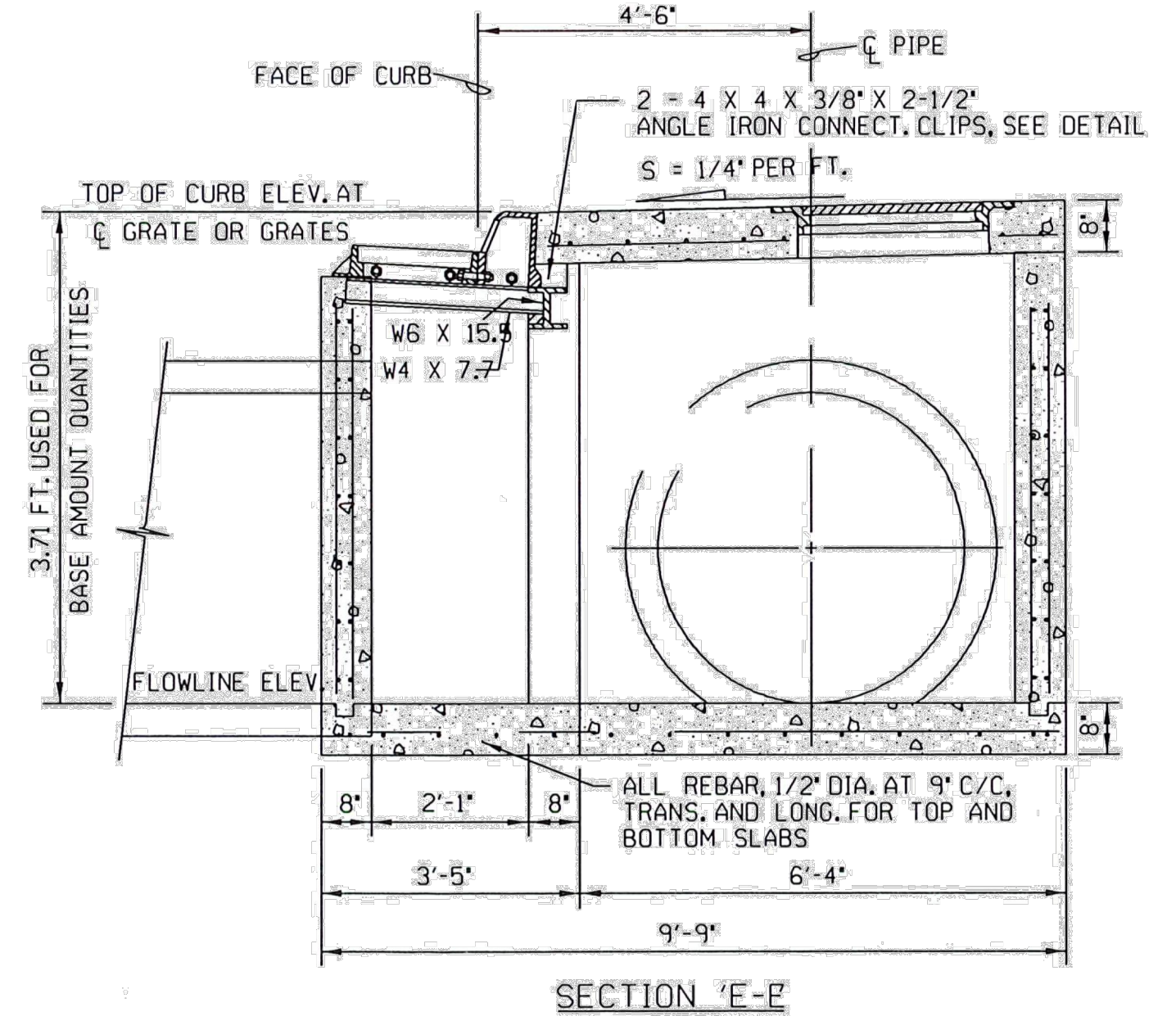
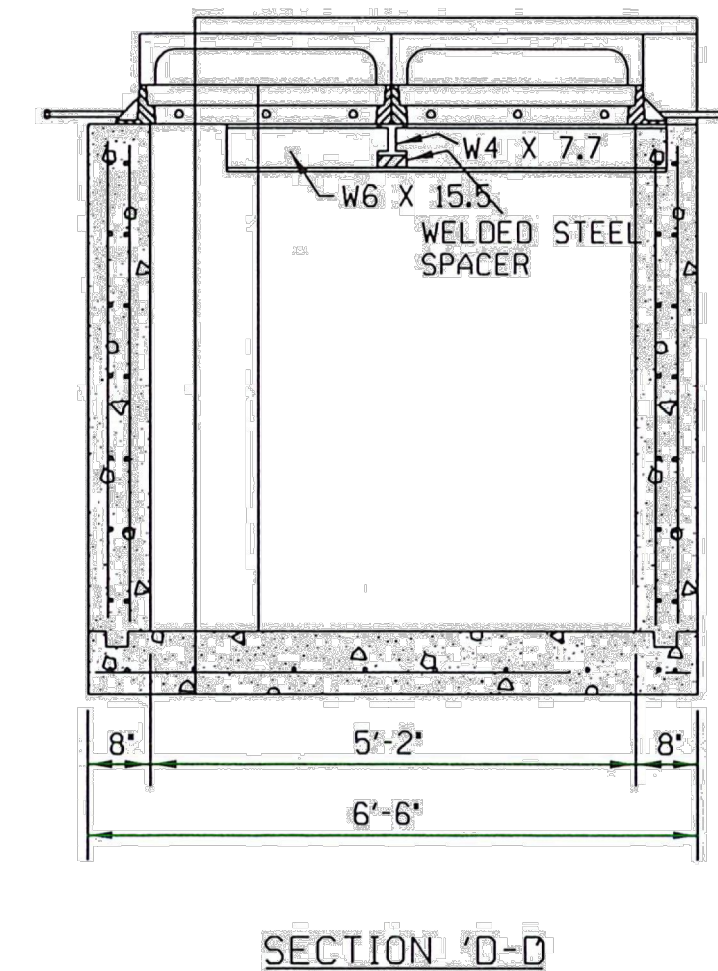
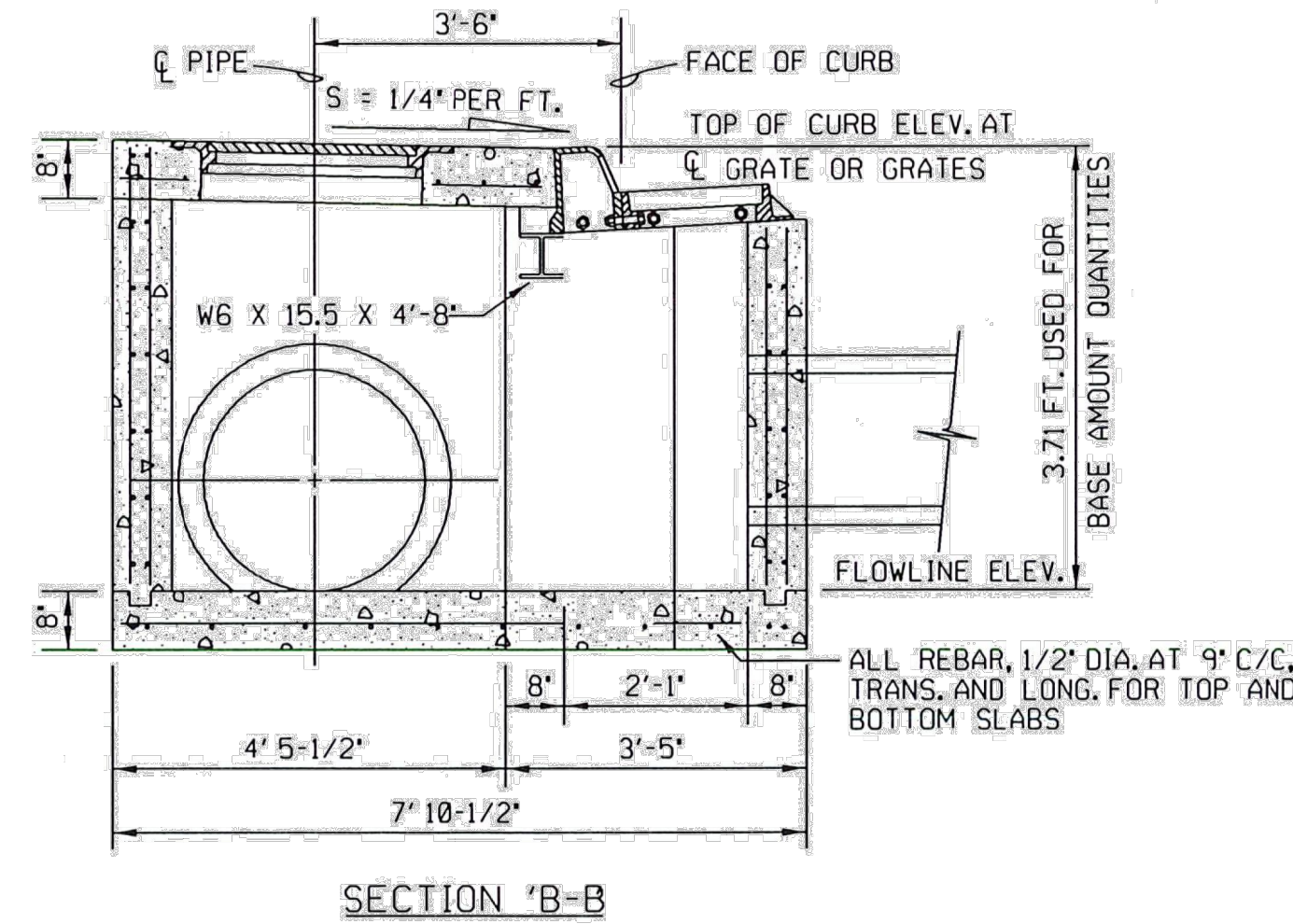
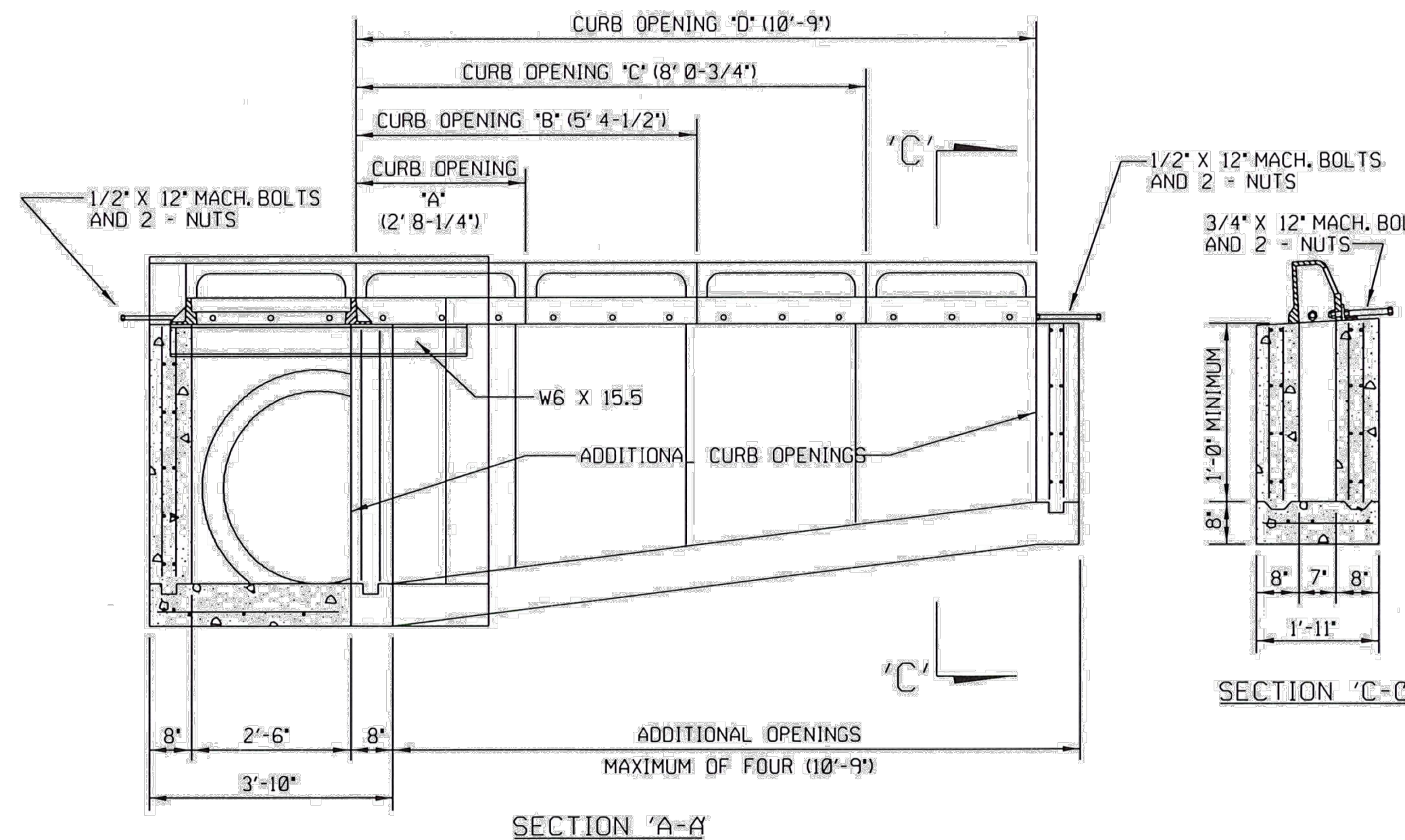
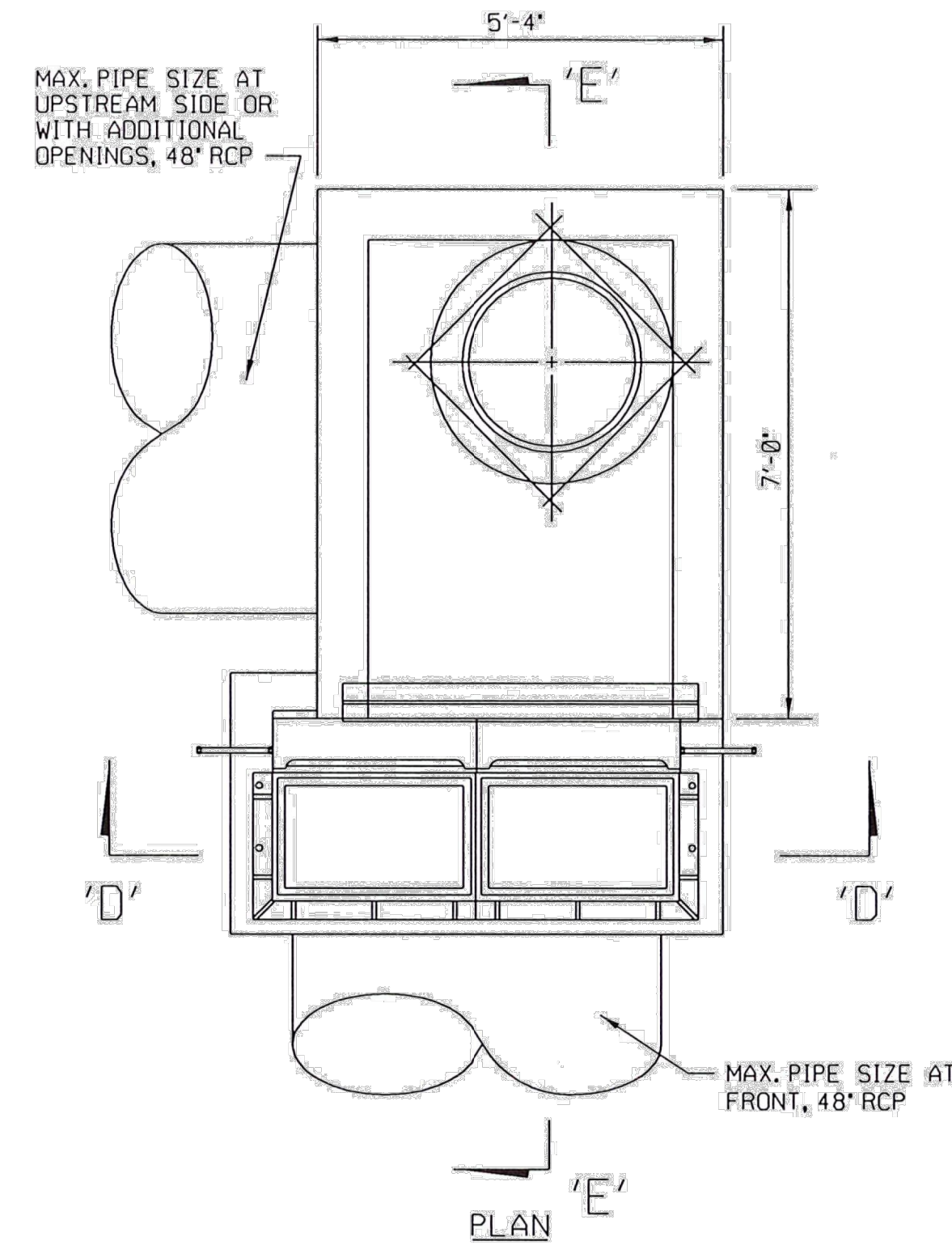
C.I. CURB HEIGHTS		
TYPE	'A'	'B'
4' MOUNTABLE	4'-1/2"	9'-1/2"
6' MOUNTABLE	6'-1/2"	11'-1/2"
8' BARRIER	6'-1/2"	11'-1/2"
8' BARRIER	8'-1/2"	13'-1/2"

ENGINEERING DIVISION, CITY OF NORMAN

**STANDARD INLETS AND GRATES W/ ACCESS
MANHOLE BACK OF CURB**

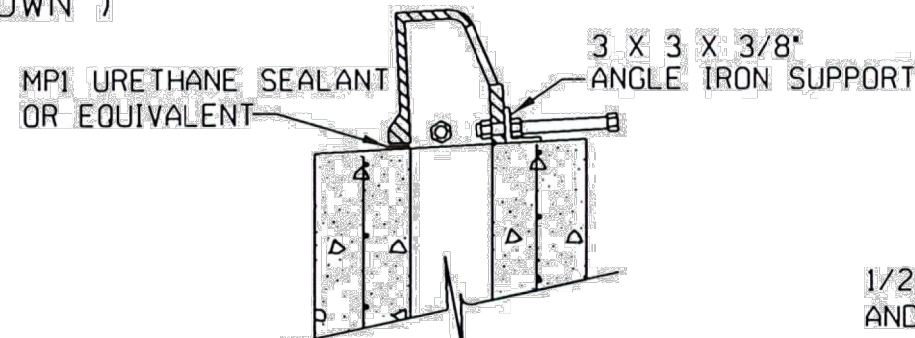


QUANTITIES FOR INLETS							
INLET	CURB OPENING	CLASS "A" CONCRETE	INLET		INLET FRAME AND GRATE	CAST IRON CURB INLET	MH FRAME AND COVER
DESIGN	DESIGNATION	CU. YD.	BASE AMT.	ADD'L. C.F. PER VERT. FT.	EACH	EACH	EACH
1 WITH SMALL JUNCT. BOX	"A"	1.50	43.56	15.84	1	1	1
	"B"	1.60	47.34	17.43	1	2	1
	"C"	1.73	55.44	21.03	1	3	1
	"D"	1.86	62.26	24.63	1	4	1
2 WITH SMALL JUNCT. BOX	"A"	1.70	47.84	17.40	2	2	1
	"B"	1.83	57.01	21.00	2	3	1
	"C"	1.96	64.86	24.60	2	4	1
	"D"	2.08	71.70	28.20	2	5	1
1 WITH LARGE JUNCT. BOX	"A"	2.11	50.44	18.34	1	1	1
	"B"	2.21	54.22	19.93	1	2	1
	"C"	2.34	62.32	23.53	1	3	1
	"D"	2.47	69.14	27.13	1	4	1
2 WITH LARGE JUNCT. BOX	"A"	2.31	54.72	19.90	2	2	1
	"B"	2.43	63.89	23.50	2	3	1
	"C"	2.57	71.74	27.10	2	4	1
	"D"	2.69	78.58	30.70	2	5	1
		2.82	84.16	34.30	2	6	1

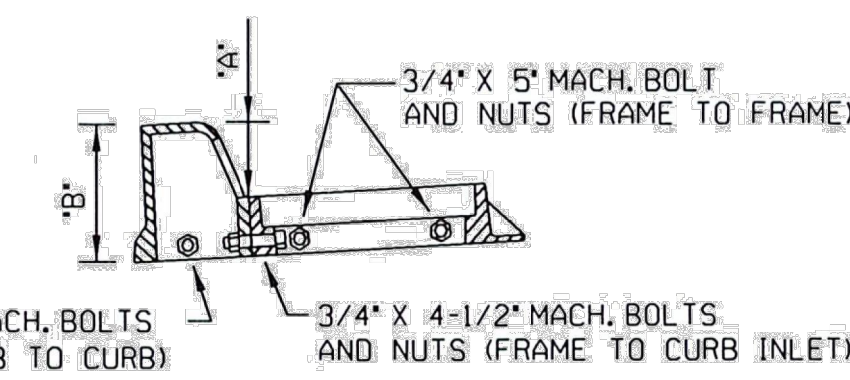


SINGLE GRATE CURB INLET WITH JUNCTION BOX (DESIGN 1-D WITH SMALL JUNCTION BOX SHOWN)

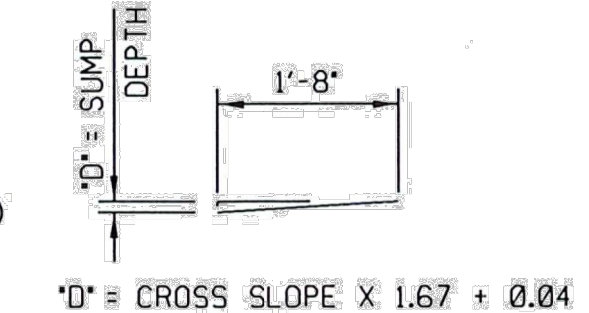
ALL REBAR IN WALLS
#4 @ 12" CTRS. EA. WAY
(TYPICAL)



ADDITIONAL CURB OPENING DETAILS

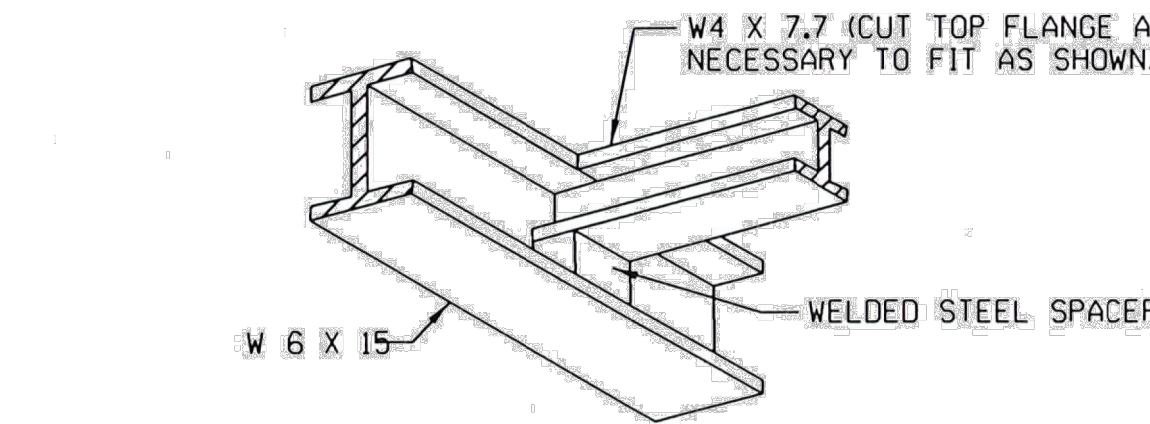


FRAME AND CURB DETAILS



DOUBLE GRATE CURB INLET WITH JUNCTION BOX (DESIGN 2 WITH LARGE JUNCTION BOX SHOWN) 18" THRU 30" LONGITUDINAL PIPE REQUIRES SMALL JUNCTION BOX

ALL REBAR IN WALLS
#4 @ 12" CTRS. EA. WAY
(TYPICAL)



I-BEAM CONNECTION DETAIL FOR DOUBLE GRATE

ANGLE IRON LENGTHS	
OPENING	LENGTH
"A"	2' 5-3/8"
"B"	5' 1-5/8"
"C"	7' 9-7/8"
"D"	10' 6-1/8"

C.I. CURB HEIGHTS		
TYPE	"A"	"B"
4" MOUNTABLE	4-1/2"	9-1/2"
6" MOUNTABLE	6-1/2"	11-1/2"
6" BARRIER	6-1/2"	11-1/2"
8" BARRIER	8-1/2"	13-1/2"

ENGINEERING DIVISION, CITY OF NORMAN

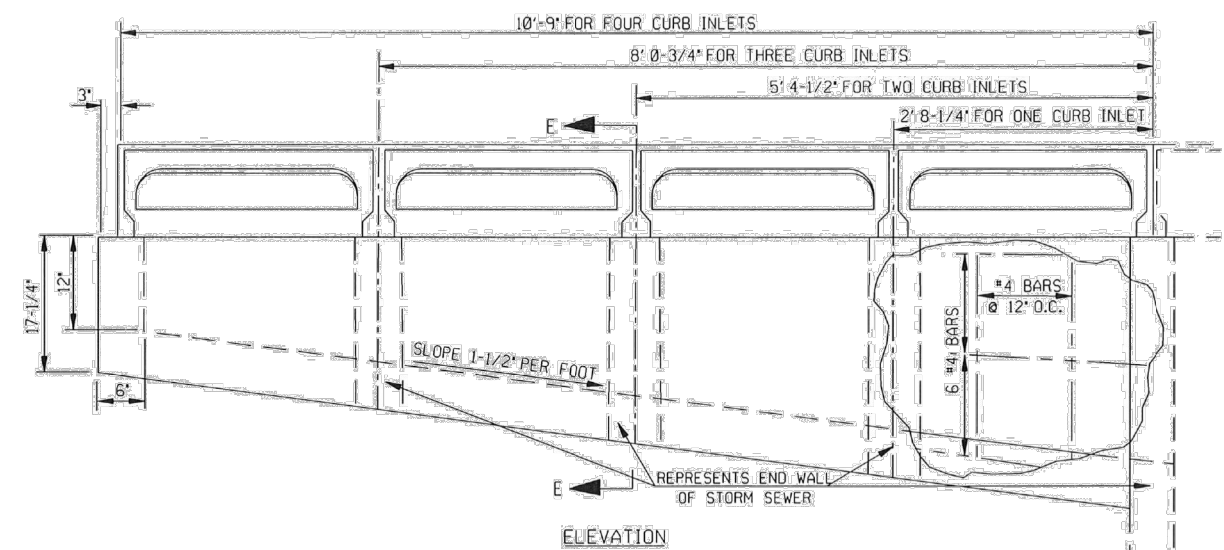
PRECAST STANDARD INLETS AND GRATES
W/ ACCESS MANHOLE BACK OF CURB

APPROVED BY: _____
CITY ENGINEER

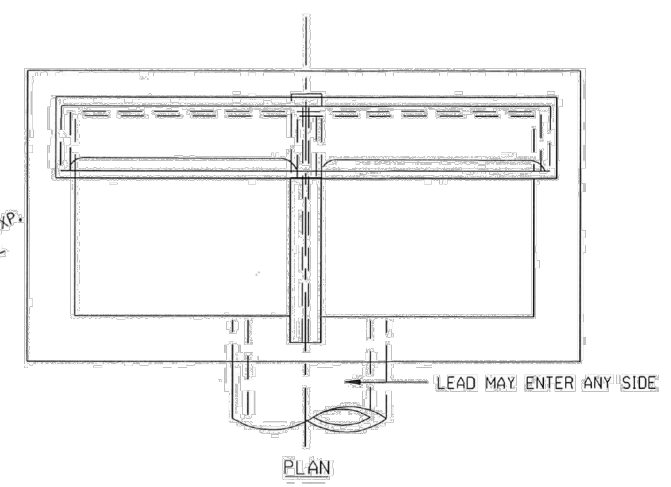
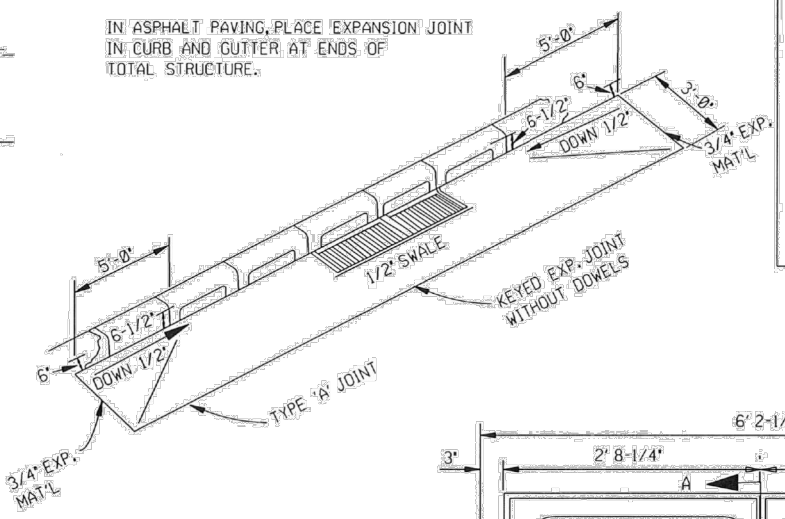
DATE: 01/2023

DRAWING NO: SD 12

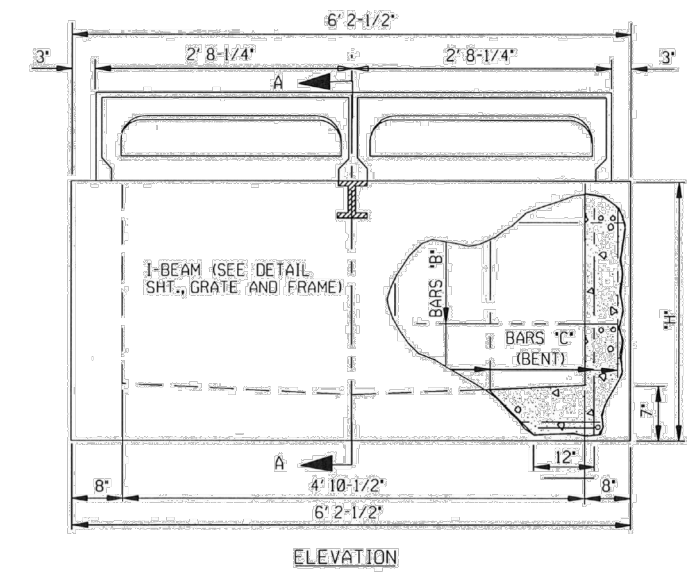
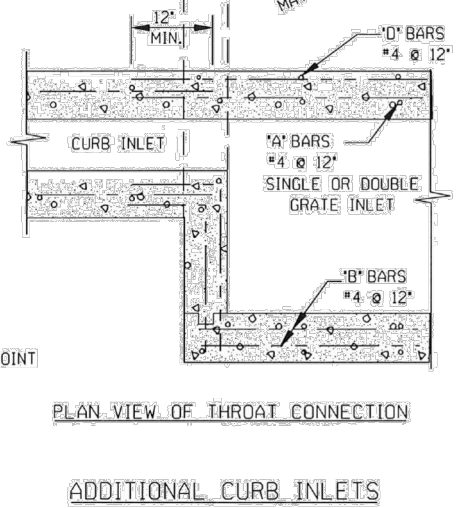
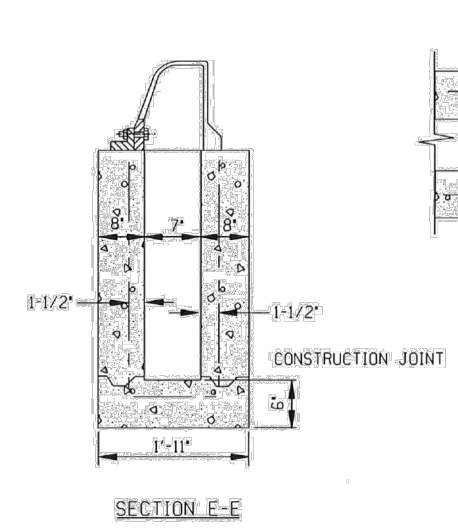
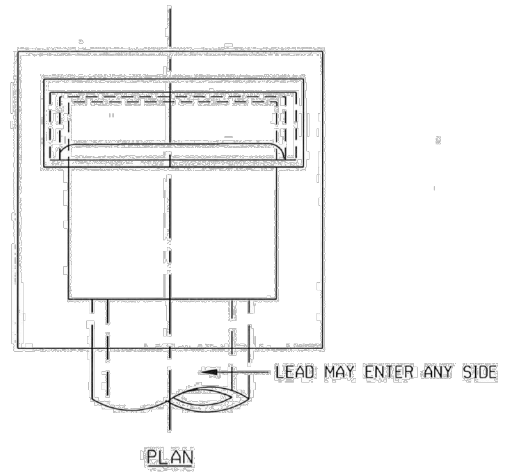
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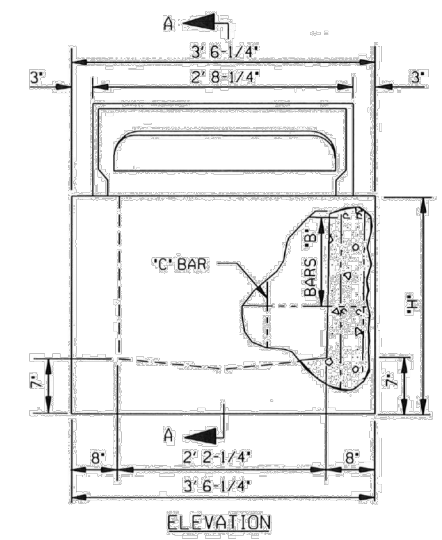
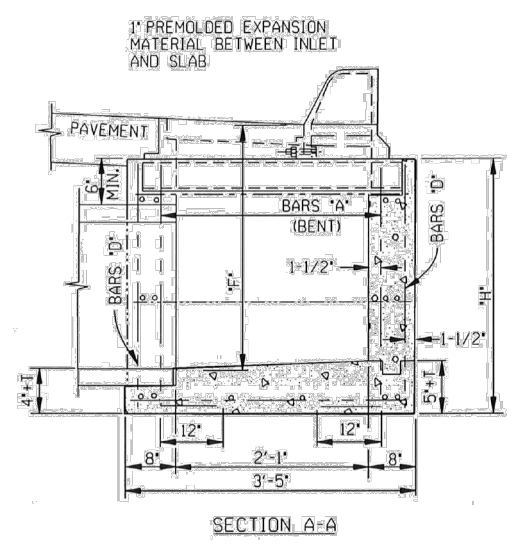
• DOUBLE GRATE IN SUMP AREAS ONLY.
THIS SECTION TO BE USED IN CONCRETE PAVING.
IN ASPHALT PAVING, PLACE EXPANSION JOINT IN CURB AND GUTTER AT ENDS OF TOTAL STRUCTURE.



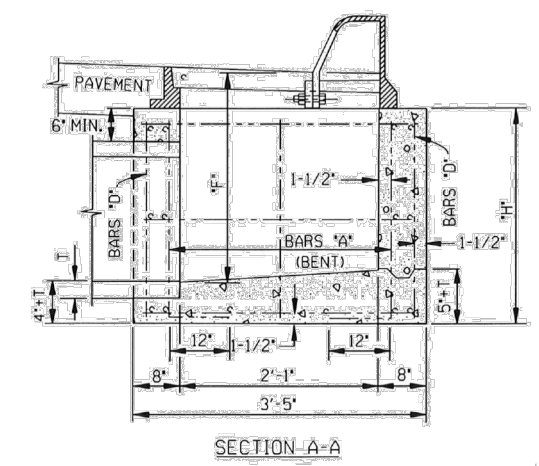
ALL PRE-CAST INLET JOINTS SHALL HAVE BUTYL ROPE INSTALLED AND GROUTING SHALL BE PLACED INSIDE THE INLET AT EACH JOINT.
CURB INLETS SHALL BE PLACED ON UPSTREAM SIDE OF GRATE INLETS UNLESS OTHERWISE SPECIFIED.
CONCRETE TROUGH FOR CURB INLETS AND CONCRETE STORM SEWER INLETS SHALL BE CONSTRUCTED AS TWO PARTS WITH OMNI-FLEX.



DOUBLE GRATE AND CURB INLET
DESIGN - 2



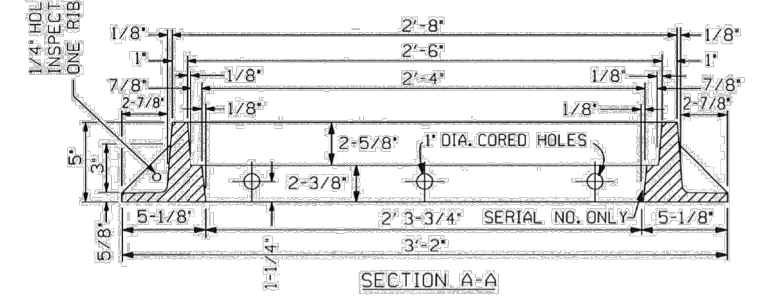
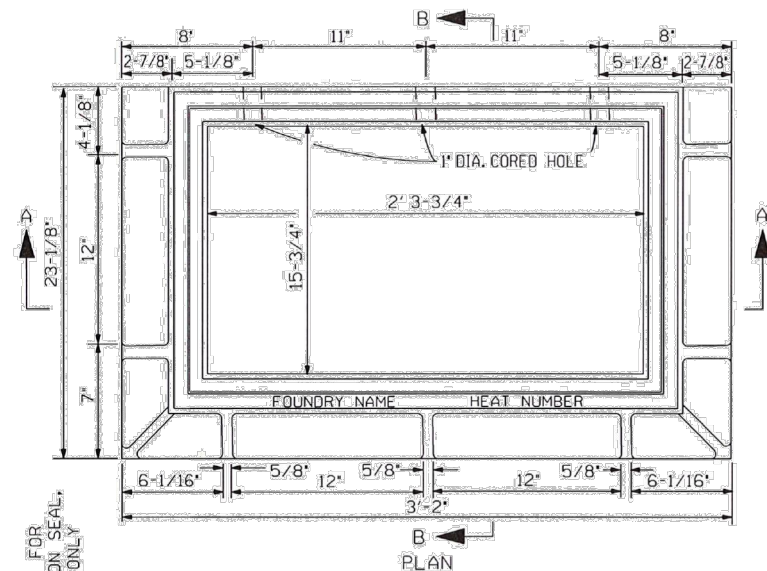
SINGLE GRATE AND CURB INLET
DESIGN - 1



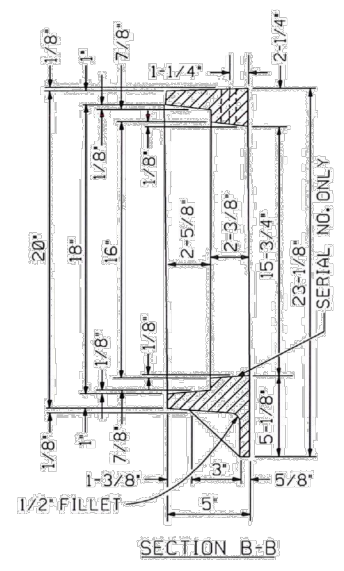
BAR LIST FOR SINGLE GRATE AND CURB INLET			
SIZE OF LEAD	H MINIMUM	F MINIMUM	
15"	2'-6"	2.42 FT.	
18"	2'-9"	2.67 FT.	
24"	3'-7"	3.50 FT.	
BARS 'A'	BARS 'B'	BARS 'C'	BARS 'D'
SIZE	SIZE	SIZE	SIZE
*4 X H+8"	*4 X 3'-2"	*4 X H+8"	*4 X H-4"

BAR LIST FOR DOUBLE GRATE AND CURB INLET			
SIZE OF LEAD	H MINIMUM	F MINIMUM	
18"	2'-9"	2.67 FT.	
24"	3'-7"	3.50 FT.	
30"	4'-1"	4'-0"	
BARS 'A'	BARS 'B'	BARS 'C'	BARS 'D'
SIZE	SIZE	SIZE	SIZE
*4 X H+8"	*4 X 5'-0"	*4 X H+8"	*4 X H-4"

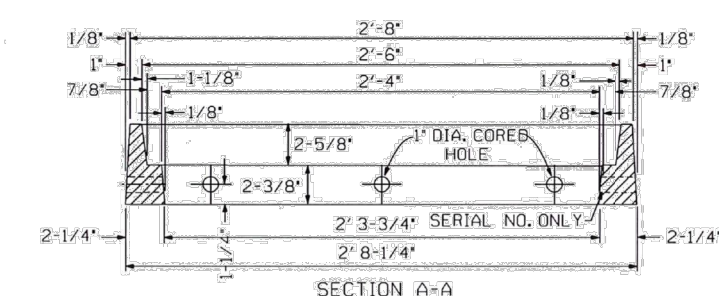
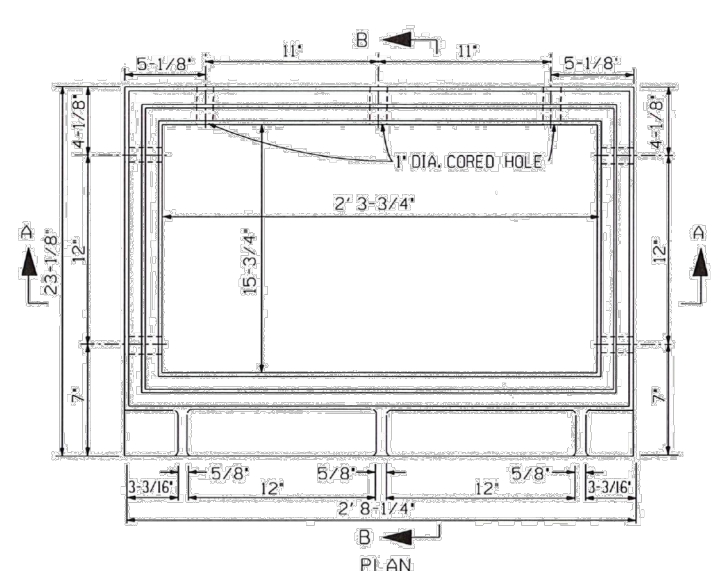
• FOR INDUSTRIAL AND ARTERIAL STREETS



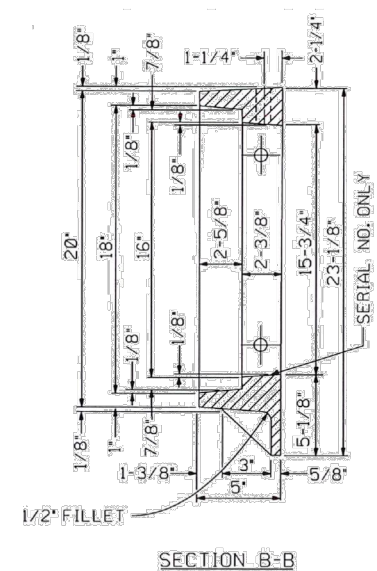
STORM SEWER INLET FRAME TYPE "A"
FOR INLET DESIGN NO. 1
 FOR USE WITH TYPE "A" GRATE



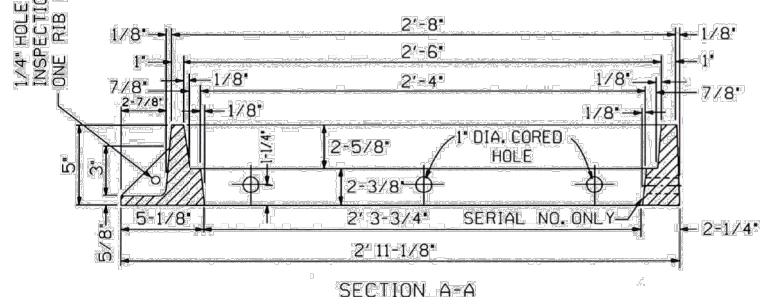
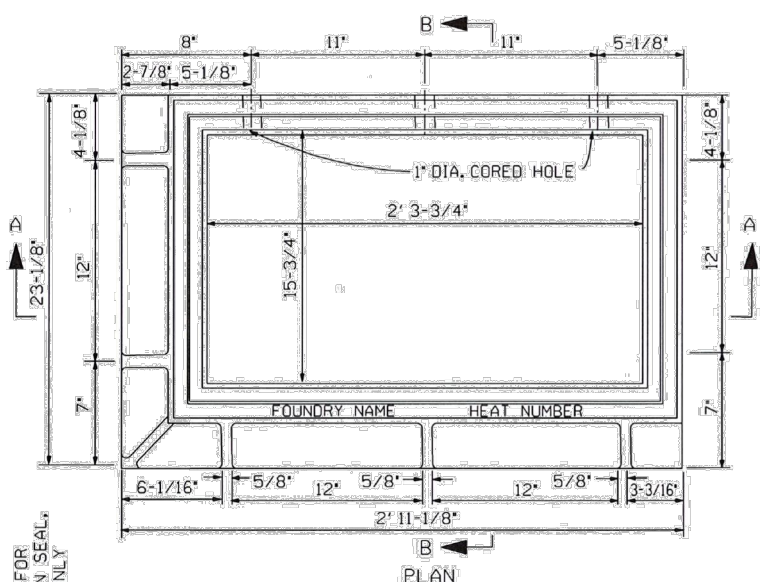
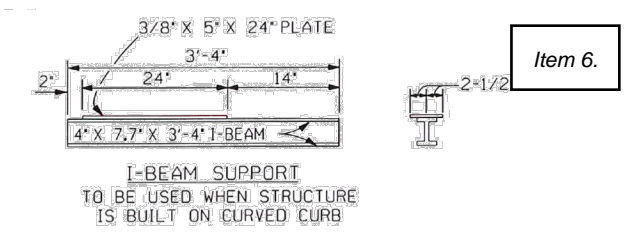
NOTE:
 ONLY ONE TYPE "A" FRAME IS REQUIRED FOR
 INLET DESIGN NO. 1
 WEIGHT = 252 LBS.



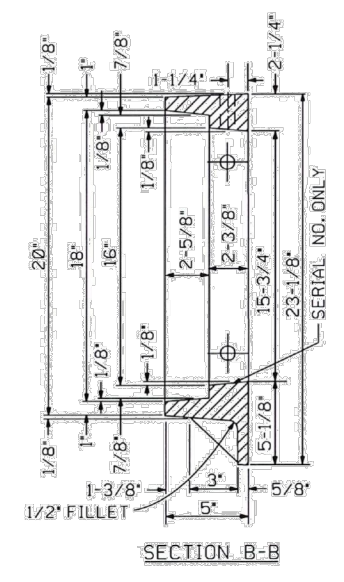
STORM SEWER INLET FRAME TYPE "C"
FOR INLET DESIGN NO. 3
 FOR USE WITH TYPE "A" GRATE



NOTE:
 TWO TYPE "B" FRAMES AND ONE TYPE "C" FRAME
 ARE REQUIRED FOR INLET DESIGN 3
 WEIGHT = 217 LBS.



STORM SEWER INLET FRAME TYPE "B"
FOR INLET DESIGN NO. 2 AND 3
 FOR USE WITH TYPE "A" GRATE



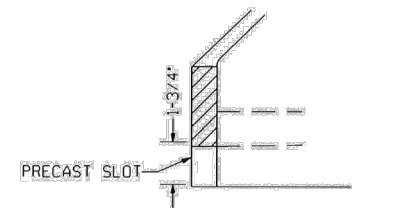
NOTE:
 MAKE ONE FRAME AS SHOWN AND ONE
 REVERSED FOR DOUBLE FRAMES.
 WEIGHT = 234 LBS.

TOLERANCES	INCHES	
	PLUS	MINUS P.
DIAMETER OF ROUND LIDS AND FRAME RECESS FOR ROUND LIDS	1/16"	1/16"
LENGTH AND WIDTH OF SQUARE OR RECTANGULAR LIDS	1/16"	1/8"
LENGTH AND WIDTH OF FRAME RECESS FOR SQUARE OR RECTANGULAR LIDS	1/8"	1/16"
METAL THICKNESS	1/16"	1/16"
ALL OTHER DIMENSIONS	1/8"	1/8"

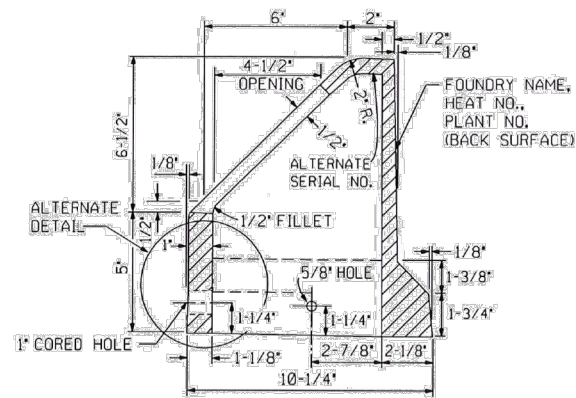
ENGINEERING DIVISION, CITY OF NORMAN

STANDARD STORMWATER FRAMES

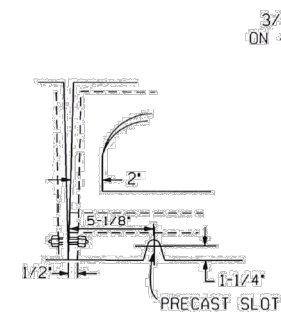
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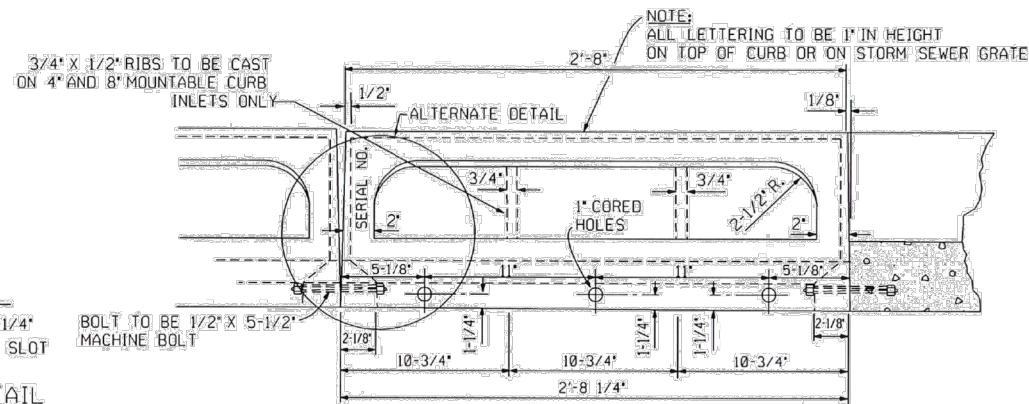
ALTERNATE DETAIL
ALL CURBS (TYPICAL)



6" MOUNTABLE CURB
183 LBS.

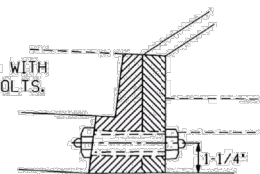


ALTERNATE DETAIL
ALL CURBS (TYPICAL)

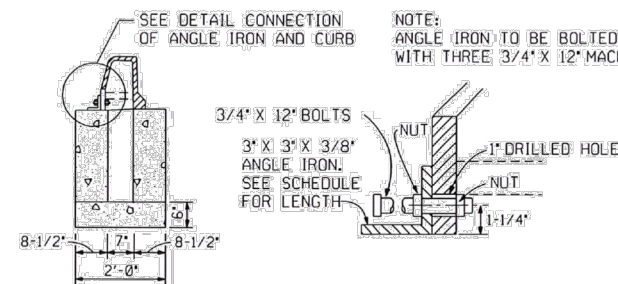


CAST IRON STORM SEWER CURB INLET

NOTE:
FRAME TO BE BOLTED TO CURB WITH
THREE 3/4" X 4-1/2" MACHINE BOLTS.
SEE CURRENT STD. SCF-4
FOR FRAME AND GRATE.



DETAIL OF CONNECTION
FRAME AND CAST IRON CURB



DETAIL OF CONNECTION
ANGLE IRON AND CAST IRON CURB

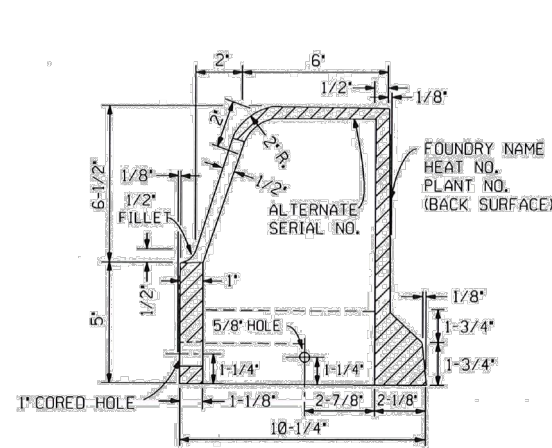
DUMP NO WASTE □ DRAINS TO RIVER

FOR 6" MOUNTABLE CURB

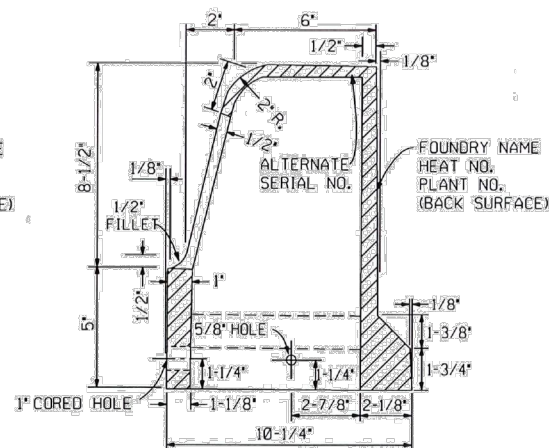
DUMP NO WASTE
DRAINS TO RIVER

FOR 6" AND 8" BARRIER CURB

LAYOUT FOR CURB NOTE



6" BARRIER CURB
200 LBS.



8" BARRIER CURB
222 LBS.

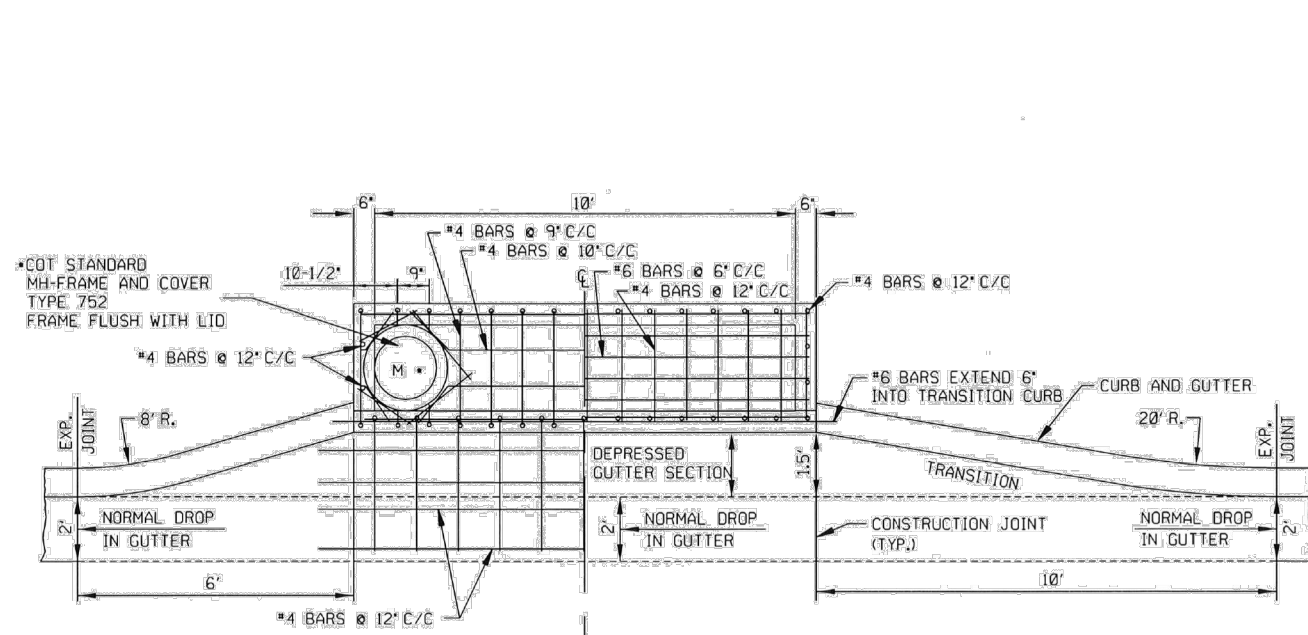
TOLERANCES	INCHES	
	PLUS	MINUS
DIAMETER OF ROUND LIDS AND FRAME RECESS FOR ROUND LIDS	1/16	1/16
LENGTH AND WIDTH OF SQUARE OR RECTANGULAR LIDS	1/16	1/8
LENGTH AND WIDTH OF FRAME RECESS FOR SQUARE OR RECTANGULAR LIDS	1/8	1/16
METAL THICKNESS	1/16	1/16
ALL OTHER DIMENSIONS	1/8	1/8

SCHEDULE					
INLET DESIGN	CURB OPENING DESIGNATION	INLET FRAME AND GRATE EACH	CAST IRON CURB/INLET EACH	ANGLE IRON	
				NO.	LENGTH
1	A	1	2	1	2' 5-3/8"
	B	1	3	1	5' 1-5/8"
	C	1	4	1	7' 9-7/8"
	2A	1	3	2	2' 5-3/8"
	A-B	1	4	2	2' 5-3/8"
	A-C	1	5	2	2' 5-3/8"
	2B	1	5	2	5' 1-5/8"
	B-C	1	6	2	5' 1-5/8"
2	2-C	1	2	2	7' 9-7/8"
	B	2	4	1	5' 1-5/8"
	D	2	6	1	10' 6-1/8"
	2B	2	6	2	5' 1-5/8"
	B-D	2	8	2	5' 1-5/8"
	2D	2	10	2	10' 6-1/8"
	B	3	3	1	5' 1-5/8"
	D	3	7	1	10' 6-1/8"
3	2B	3	7	2	5' 1-5/8"
	B-D	3	9	2	5' 1-5/8"
	2D	3	11	2	10' 6-1/8"
	2D	3	11	2	10' 6-1/8"

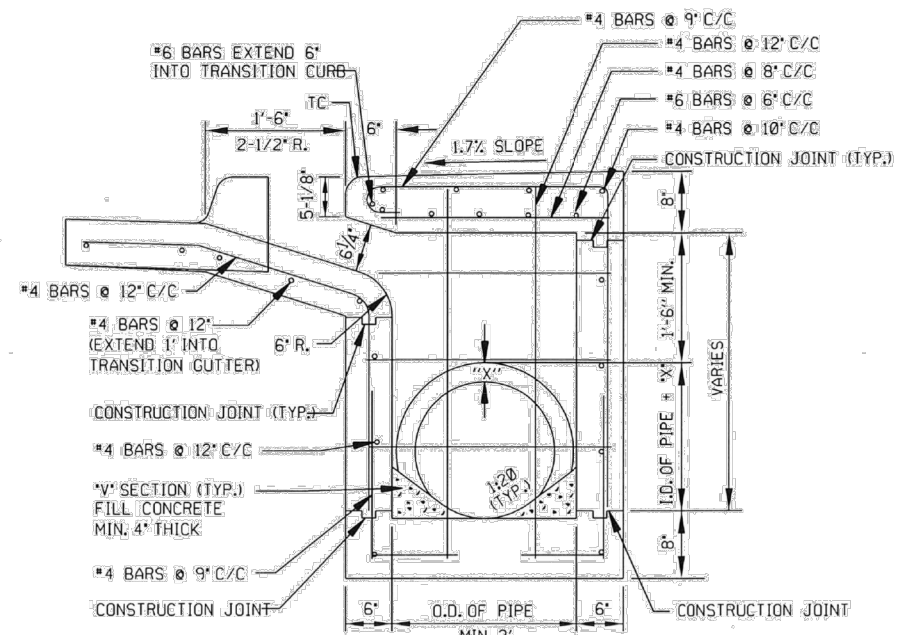
NOTE: CONFIGURATIONS ARE NOT LIMITED TO THOSE SHOWN ABOVE.

ENGINEERING DIVISION, CITY OF NORMAN

STANDARD CAST IRON CURB

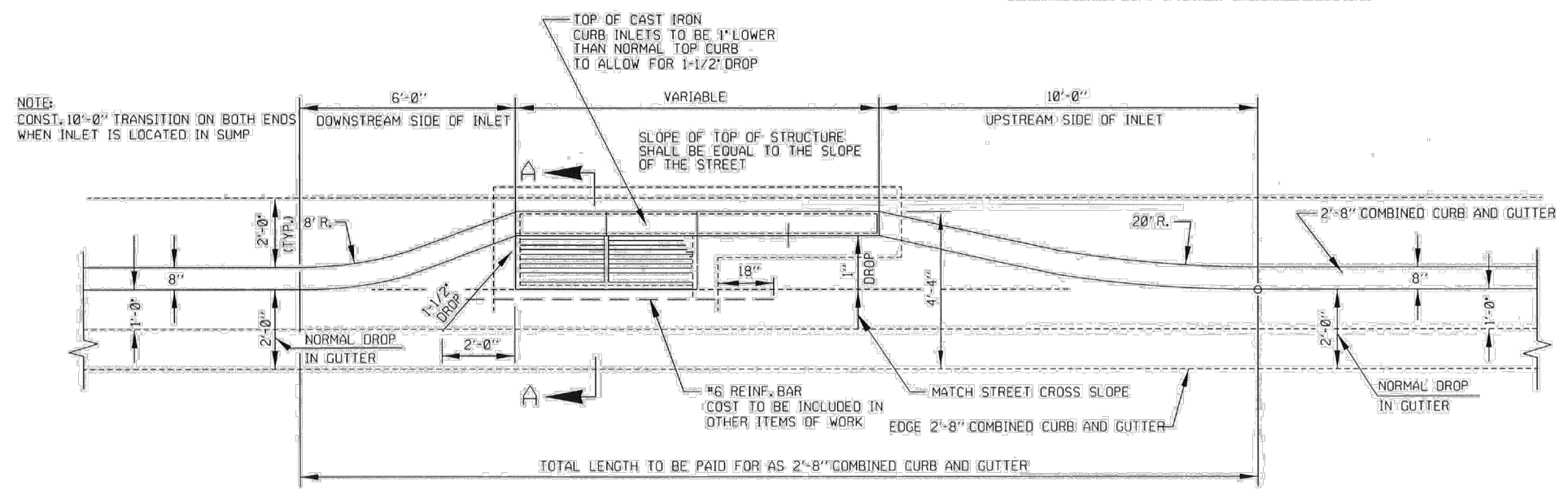


PLAN - SECTION



ELEVATION - SECTION A-A

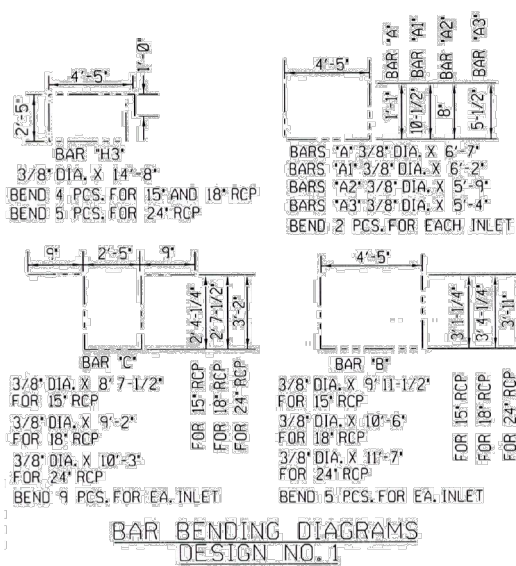
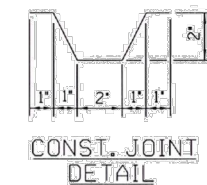
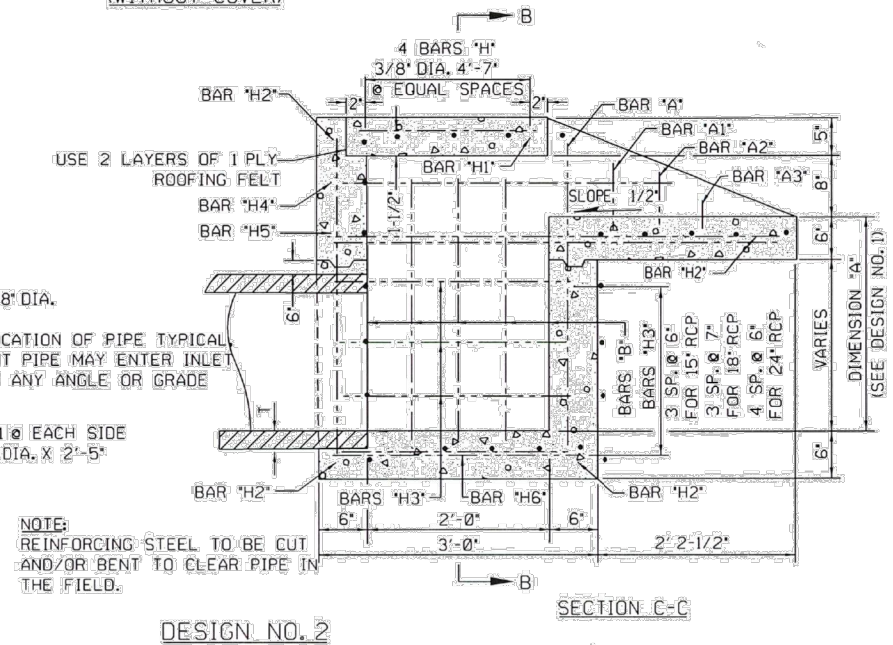
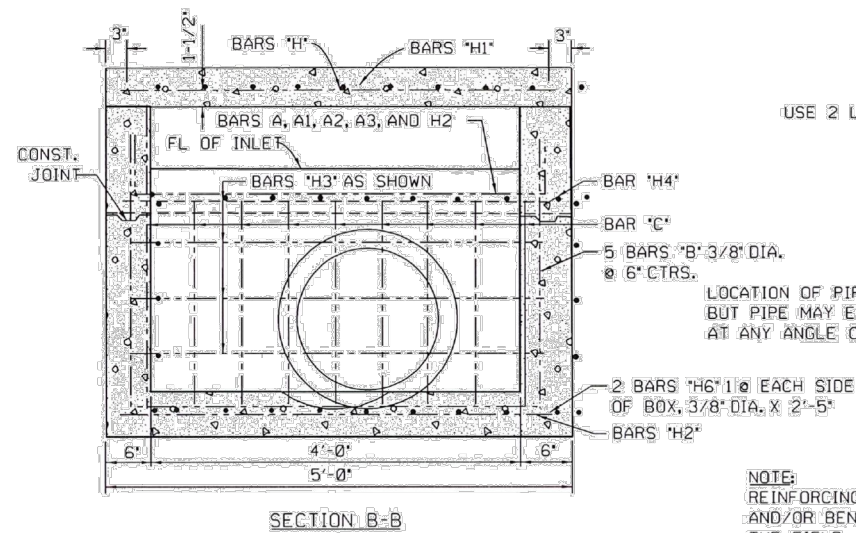
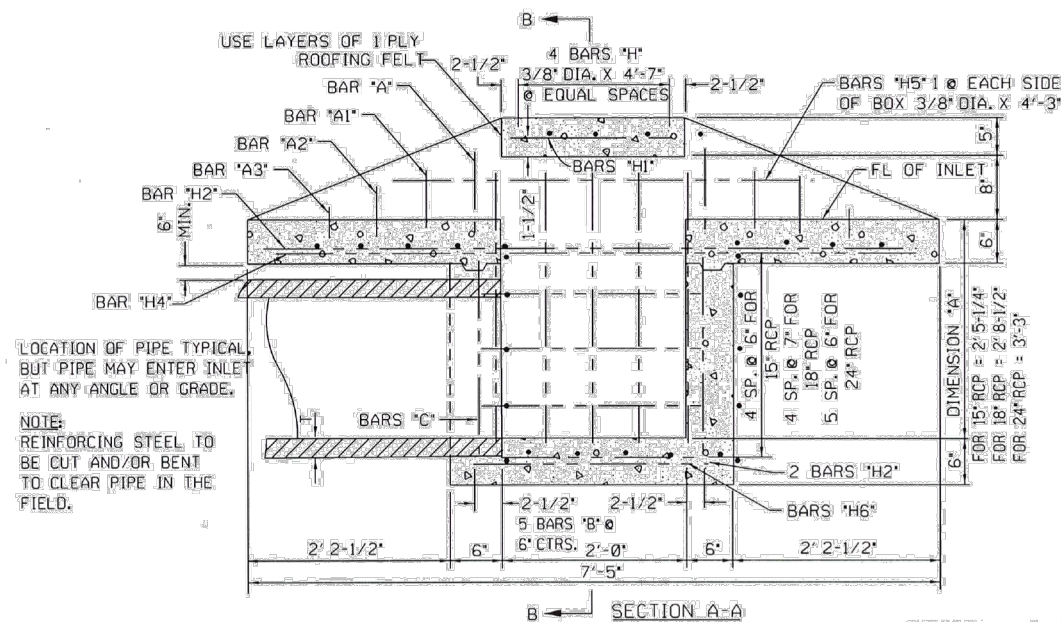
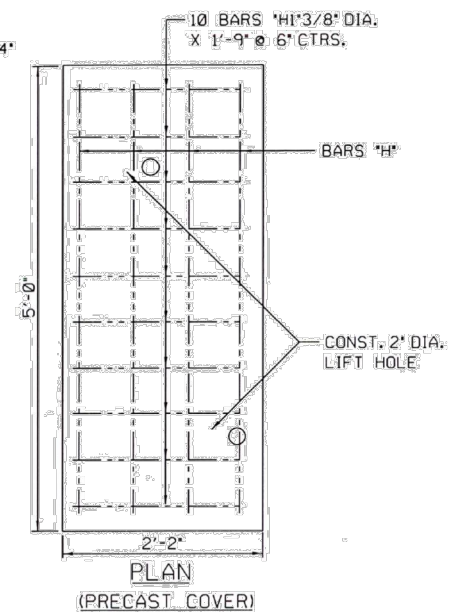
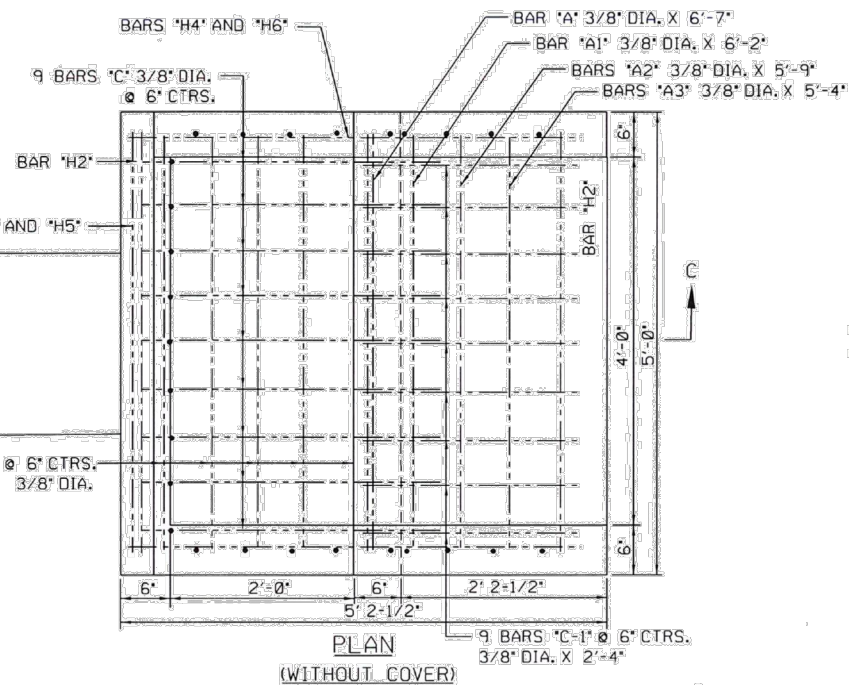
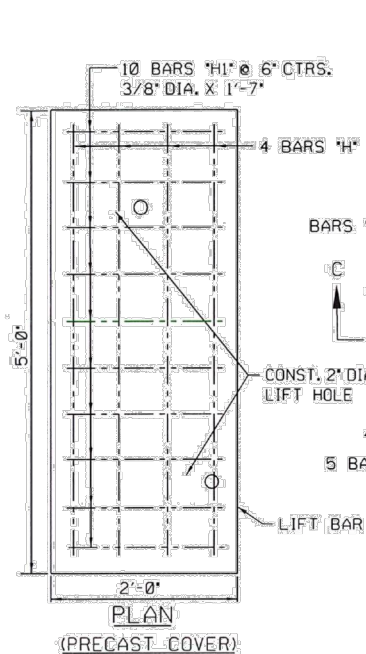
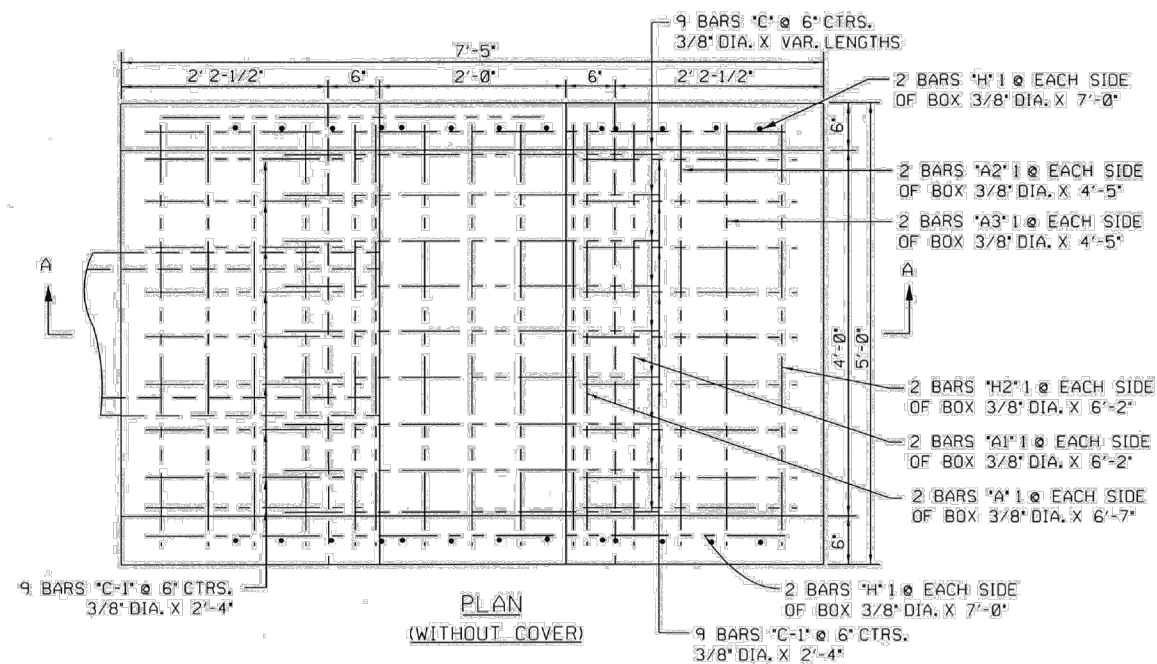
RECESSED CURB INLET



CURB TURNOUT FOR RECESSED CAST IRON CURB INLET

NOT TO SCALE

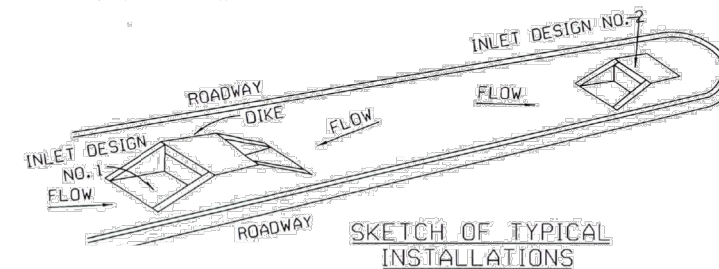
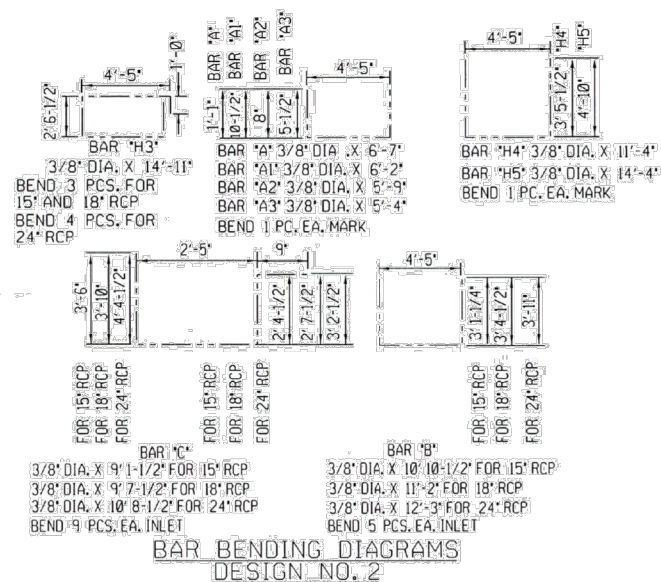
ENGINEERING DIVISION, CITY OF NORMAN		
STANDARD RECESSED CURB INLET		
APPROVED BY: _____ CITY ENGINEER	DATE: 01/2023	DRAWING NO: SD 16

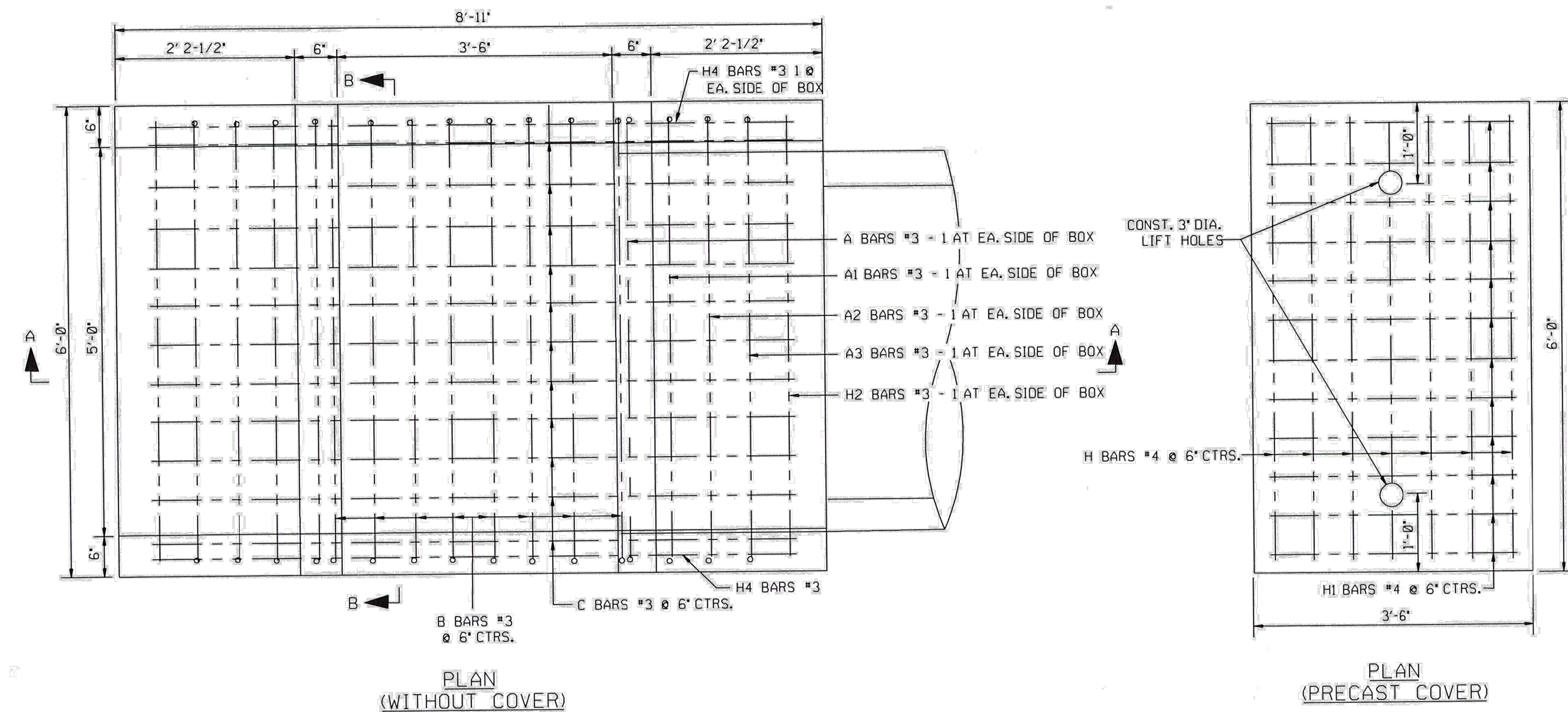


DESIGN NO. 1										DESIGN NO. 2													
15" RCP				18" RCP				24" RCP				15" RCP				18" RCP				24" RCP			
MARK	NO. PCS.	SHAPE	LENGTH	NO. PCS.	SHAPE	LENGTH	NO. PCS.	SHAPE	LENGTH	MARK	NO. PCS.	SHAPE	LENGTH	NO. PCS.	SHAPE	LENGTH	NO. PCS.	SHAPE	LENGTH				
A 2	BENT	6'-7"	2	BENT	6'-7"	2	BENT	6'-7"	A 1	BENT	6'-7"	1	BENT	6'-7"	1	BENT	6'-7"	1	BENT	6'-7"			
A1	BENT	6'-2"	2	BENT	6'-2"	2	BENT	6'-2"	A 1	BENT	6'-2"	1	BENT	6'-2"	1	BENT	6'-2"	1	BENT	6'-2"			
A2	BENT	5'-9"	2	BENT	5'-9"	2	BENT	5'-9"	A 1	BENT	5'-9"	1	BENT	5'-9"	1	BENT	5'-9"	1	BENT	5'-9"			
A3	BENT	5'-4"	2	BENT	5'-4"	2	BENT	5'-4"	A 1	BENT	5'-4"	1	BENT	5'-4"	1	BENT	5'-4"	1	BENT	5'-4"			
B 5	BENT	10' 7-1/2"	5	BENT	11'-2"	5	BENT	12'-3"	B 5	BENT	10' 7-1/2"	5	BENT	11'-2"	5	BENT	12'-3"	5	BENT	12'-3"			
C 9	BENT	8'-7-1/2"	9	BENT	9'-2"	9	BENT	10'-3"	C 9	BENT	9'-1-1/2"	9	BENT	9' 7-1/2"	9	BENT	10'-8-1/2"	9	BENT	10'-8-1/2"			
C1	STR.	2'-4"	18	STR.	2'-4"	18	STR.	2'-4"	C 9	STR.	2'-4"	9	STR.	2'-4"	9	STR.	2'-4"	9	STR.	2'-4"			
H 4	STR.	4'-7"	4	STR.	4'-7"	4	STR.	4'-7"	H 4	STR.	4'-7"	4	STR.	4'-7"	4	STR.	4'-7"	4	STR.	4'-7"			
H1	STR.	1'-7"	10	STR.	1'-7"	10	STR.	1'-7"	H1	STR.	1'-9"	10	STR.	1'-9"	10	STR.	1'-9"	10	STR.	1'-9"			
H2	STR.	4'-5"	4	STR.	4'-5"	4	STR.	4'-5"	H2	STR.	4'-7"	4	STR.	4'-7"	4	STR.	4'-7"	4	STR.	4'-7"			
H3	BENT	14'-8"	4	BENT	14'-8"	5	BENT	14'-8"	H3	BENT	14'-11"	3	BENT	14'-11"	4	BENT	14'-11"	4	BENT	14'-11"			
H4	STR.	7'-0"	2	STR.	7'-0"	2	STR.	7'-0"	H4	BENT	11'-4"	1	BENT	11'-4"	1	BENT	11'-4"	1	BENT	11'-4"			
H5	STR.	4'-3"	2	STR.	4'-3"	2	STR.	4'-3"	H5	BENT	14'-1"	1	BENT	14'-1"	1	BENT	14'-1"	1	BENT	14'-1"			
H6	STR.	2'-5"	2	STR.	2'-5"	2	STR.	2'-5"	H6	STR.	2'-5"	2	STR.	2'-5"	2	STR.	2'-5"	2	STR.	2'-5"			

QUANTITIES								
ITEM	15" RCP	18" RCP	24" RCP	ITEM	15" RCP	18" RCP	24" RCP	
CLASS 'A' CONCRETE	1.67 C.Y.	1.73 C.Y.	1.77 C.Y.	CLASS 'A' CONCRETE	1.52 C.Y.	1.59 C.Y.	1.64 C.Y.	
REINFORCING STEEL	135 LBS.	141 LBS.	147 LBS.	REINFORCING STEEL	118 LBS.	121 LBS.	132 LBS.	

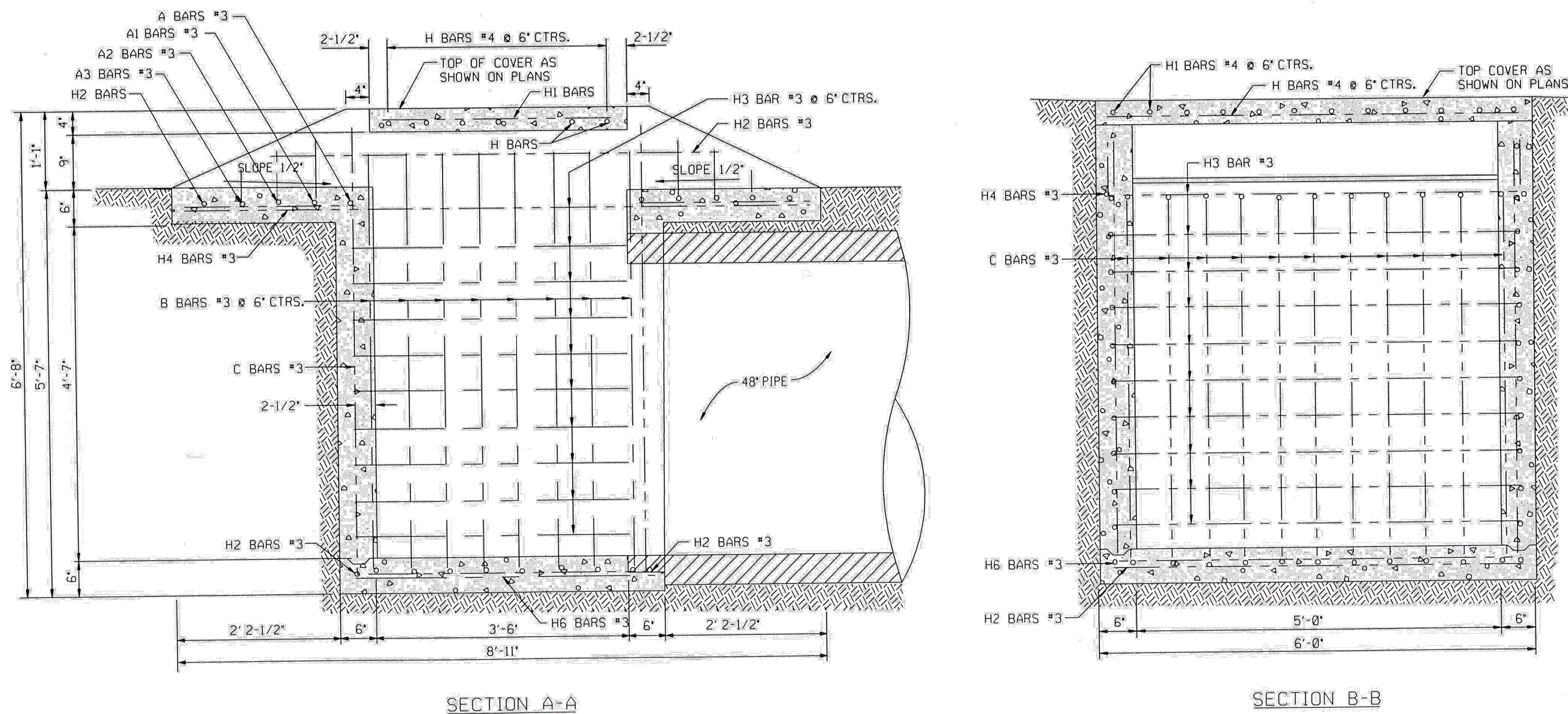
QUANTITIES PER FT. OF VERT. HT. CLASS 'A' CONC. @.026 C.Y.-REINFORCING STEEL=2.79 LBS.(SEE NOTES)





REINFORCING STEEL SCHEDULE				
BARS LIST				
MARK	NO.	SIZE	TYPE	LENGTH
A	2	#3	BENT	7'-7"
A1	2	#3	BENT	7'-2"
A2	2	#3	BENT	6'-9"
A3	2	#3	BENT	6'-4"
B	8	#3	BENT	17'-1"
C	11	#3	BENT	18'-9"
H	7	#4	STR.	5'-8"
H1	12	#4	STR.	3'-1"
H2	4	#3	STR.	5'-7"
H3	9	#3	BENT	20'-0"
H4	2	#3	STR.	8'-6"
H5	2	#3	STR.	6'-0"
H6	2	#3	STR.	4'-1"

BEND DIAGRAMS				
ALL DIMENSIONS ARE OUT TO OUT				
BARS A, A1, A2, A3, AND B = #3				
C BARS #3 X 18'-9" H3 BARS #3 X 20'-0"				



ESTIMATED QUANTITIES

QUANTITIES FOR STRUCTURE (MIN. HEIGHT)

CLASS A CONCRETE	3.22 C.Y.
REINFORCING STEEL	292 LBS.

QUANTITIES PER FOOT OF VERTICAL HEIGHT

CLASS A CONCRETE	.35 C.Y.
REINFORCING STEEL	29 LBS.

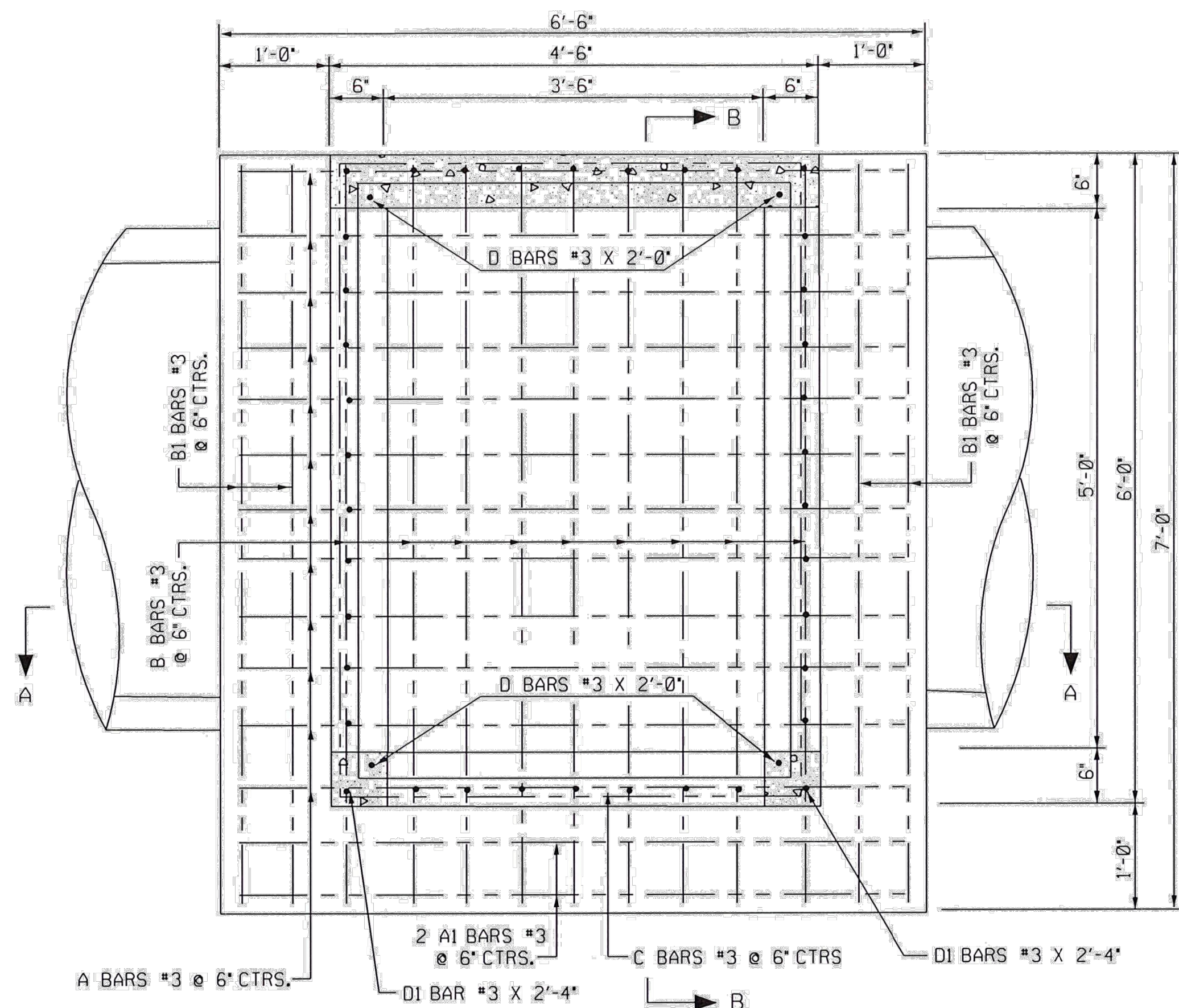
ENGINEERING DIVISION, CITY OF NORMAN

STANDARD DROP INLET 48" PIPE

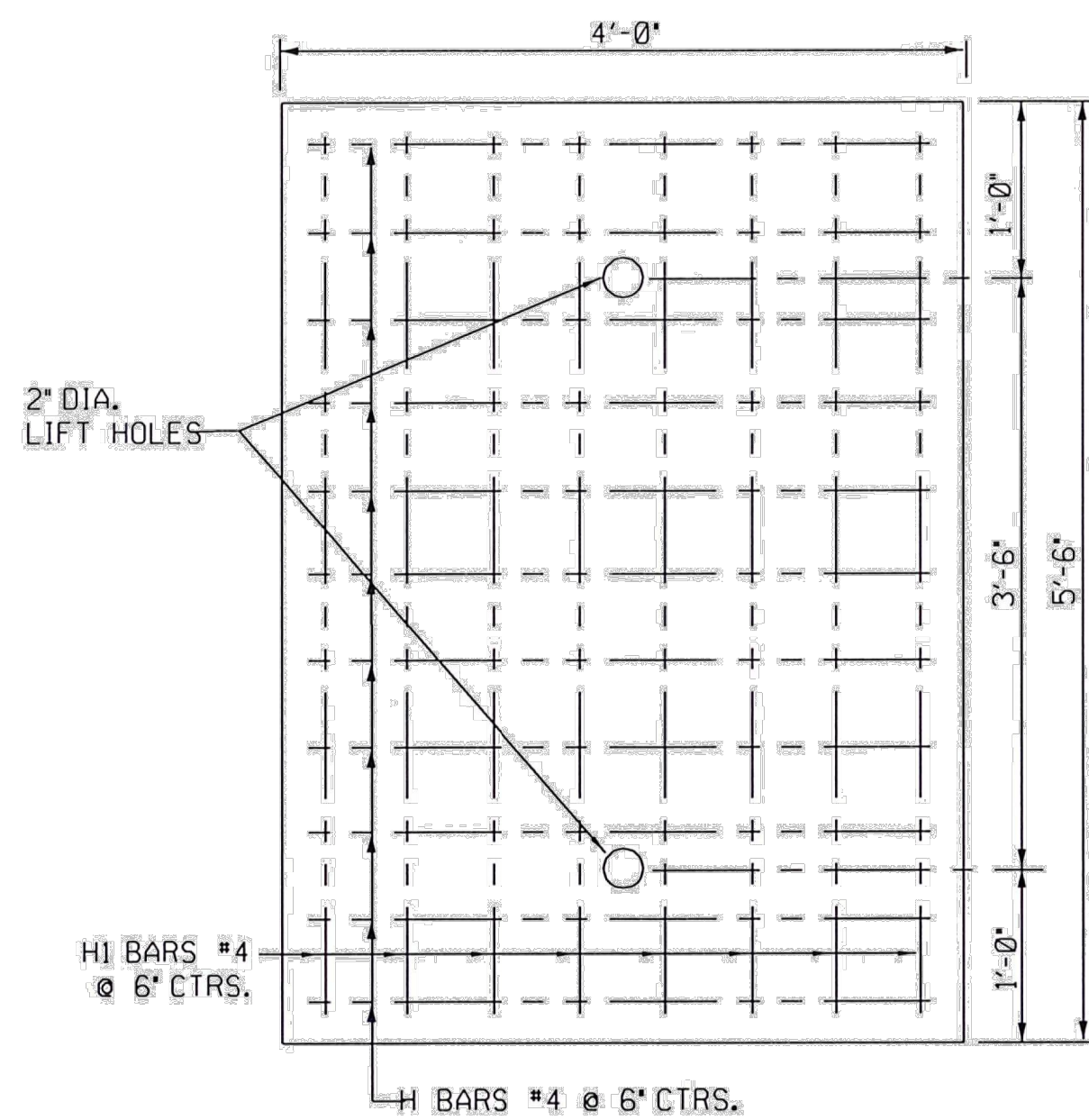
APPROVED BY: _____
CITY ENGINEER

DATE: 01/2023

DRAWING NO: SD 19

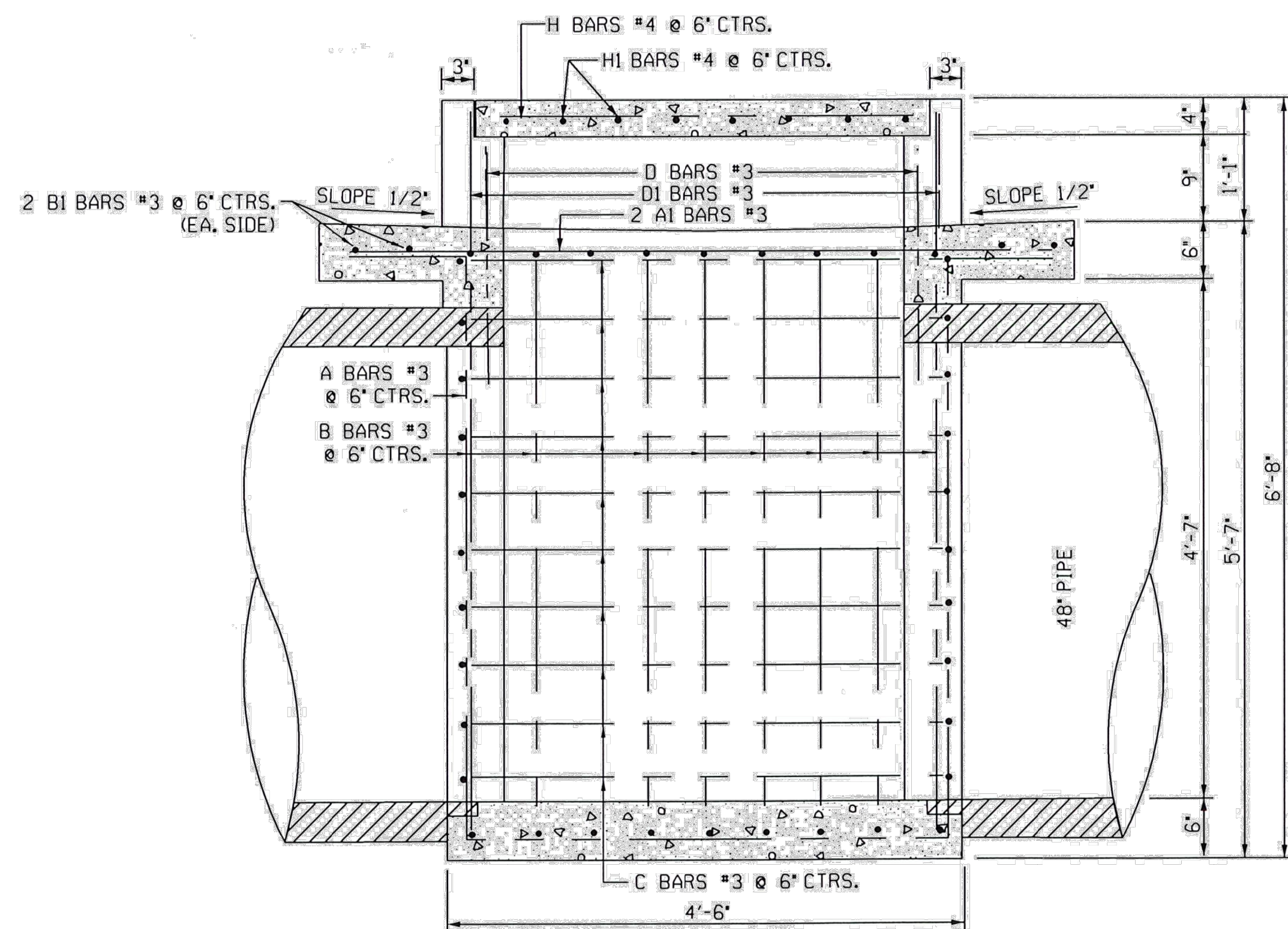


PLAN (WITHOUT COVER)

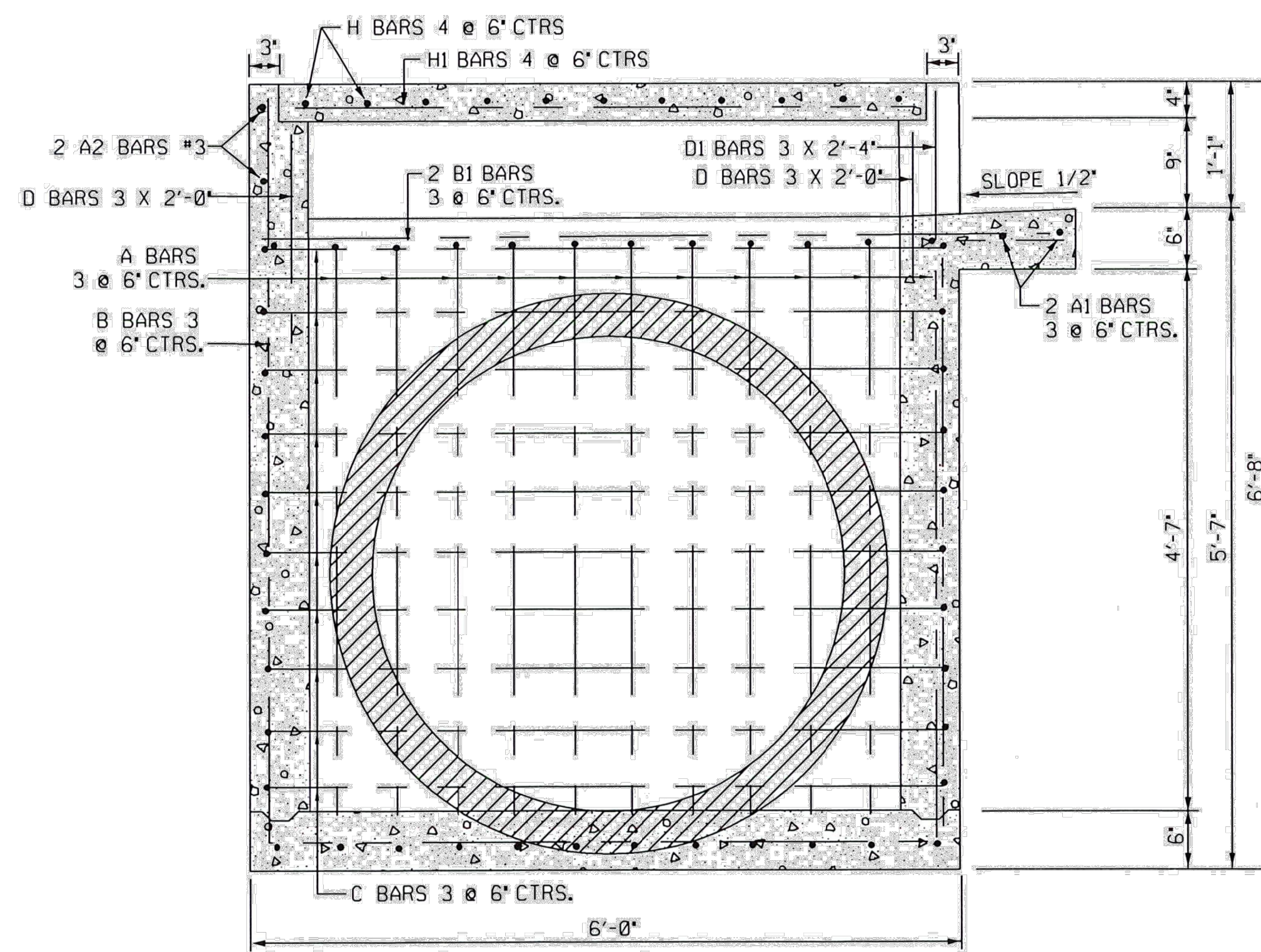


PRECAST COVER

REINFORCING STEEL SCHEDULE				
BARS LIST				
MARK	NO.	SIZE	TYPE	LENGTH
A	12	#3	BENT	16'-8"
A1	2	#3	STR.	6'-2"
A2	2	#3	STR.	4'-2"
B	9	#3	BENT	18'-3"
B1	4	#3	STR.	6'-8"
C	10	#3	BENT	20'-8"
D	4	#3	STR.	2'-0"
D1	2	#3	STR.	2'-4"
H	11	#4	STR.	3'-8"
H1	8	#4	STR.	5'-2"
BEND DIAGRAMS				
<p>B BARS 3 X 18'-3"</p> <p>C BARS 3 X 20'-8"</p> <p>A BARS 3 X 16'-8"</p>				
QUANTITIES				
<p>FOR INLET WITH MINIMUM HEIGHT</p> <p>CLASS 'A' CONCRETE 2.16 C.Y.</p> <p>GRADE 40 REINF. STEEL 282 LBS.</p> <p>FOR ADD'L FOOT OF VERT. HEIGHT</p> <p>CLASS 'A' CONCRETE .352 C.Y.</p> <p>GRADE 40 REINF. STEEL 29.82 LBS.</p>				



SECTION A-A



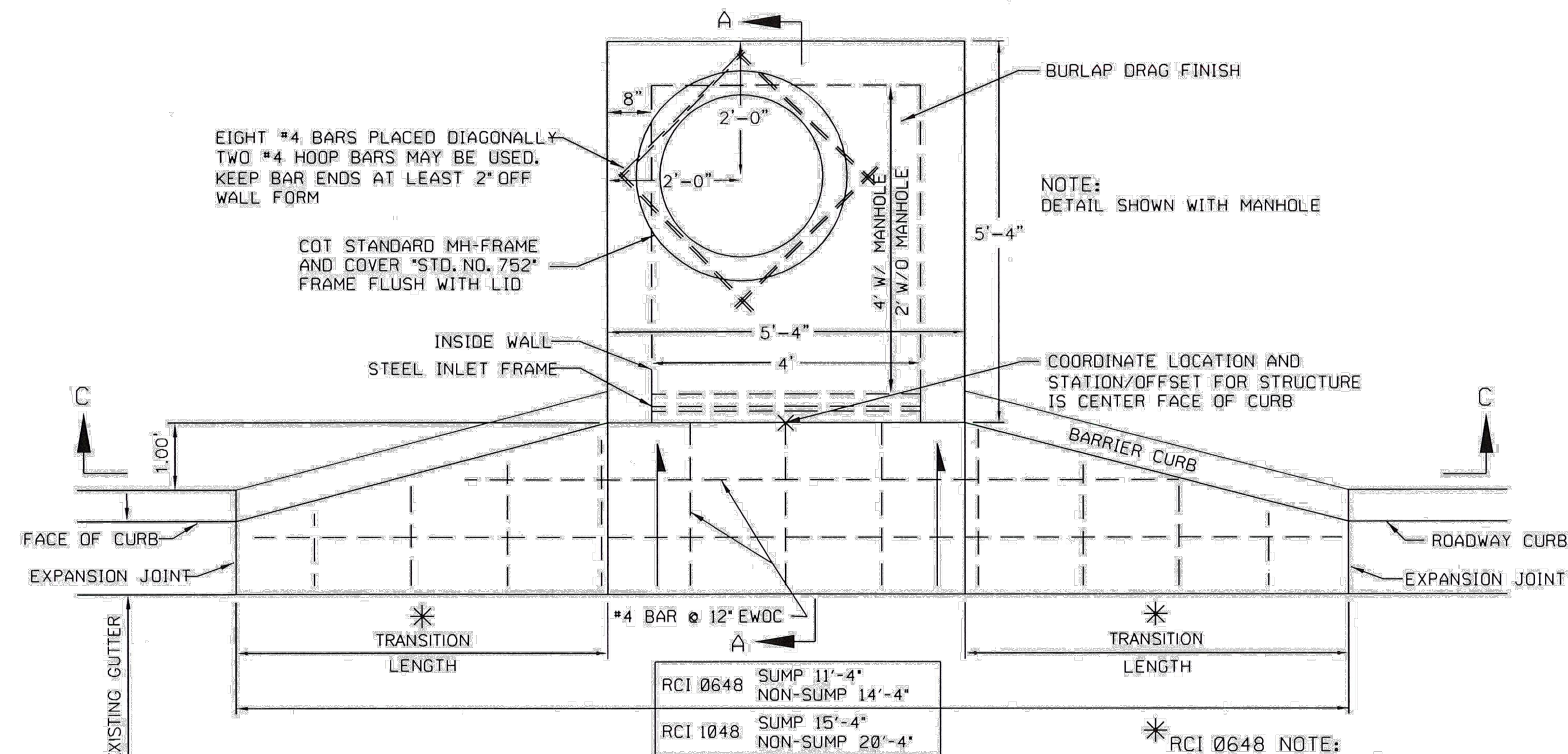
SECTION B-B

ENGINEERING DIVISION, CITY OF NORMAN

STANDARD THREE WAY DROP INLET 48"
PIPEAPPROVED BY: _____
CITY ENGINEER

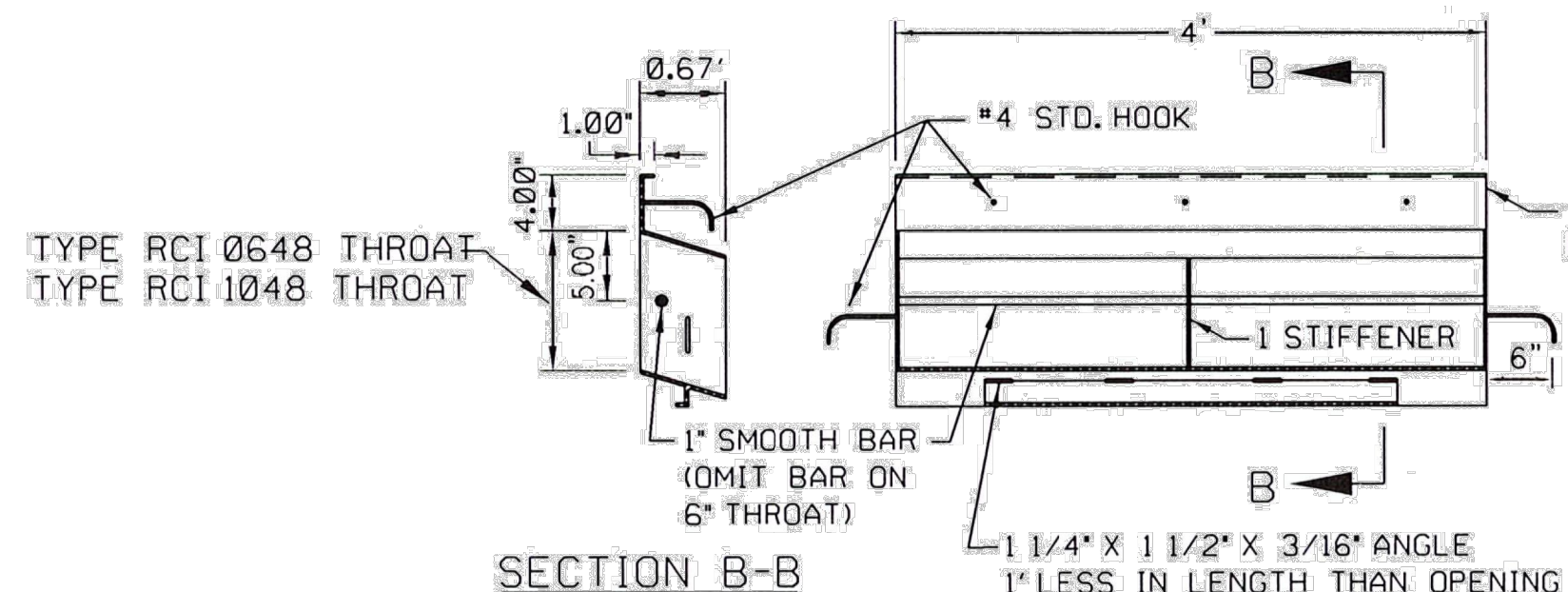
DATE: 01/2023

DRAWING NO: SD 20



* SEE NOTE FOR TRANSITIONS U/S AND D/S
U/S = UPSTREAM SIDE
D/S = DOWNSTREAM SIDE

RCI PLAN VIEW
SCALE: NONE



SECTION B-B
SCALE: NONE

FRONT VIEW
STEEL INLET INSERT DETAIL
SCALE: NONE

* RCI 0648 NOTE:
IN SUMP SITUATIONS THE TRANSITION SECTION BOTH U/S AND D/S SHALL BE 3 FEET.
IN NON-SUMP SITUATIONS THE D/S TRANSITION SECTION SHALL BE 3 FEET WHERE AS THE U/S TRANSITION SECTION SHALL BE 6 FEET.

* RCI 1048 NOTE:
IN SUMP SITUATIONS THE TRANSITION SECTION BOTH U/S AND D/S SHALL BE 5 FEET.
IN NON-SUMP SITUATIONS THE D/S TRANSITION SECTION SHALL BE 5 FEET WHERE AS THE U/S TRANSITION SECTION SHALL BE 10 FEET.

STEEL INLET FRAME NOTES
1. STEEL INLET INSERT SHALL BE AS MANUFACTURED BY SHAWNEE STEEL & WELDING, INC. OF MERIAM, KS. OR APPROVED EQUAL. REFER TO THE STEEL INLET INSERT DETAIL.

2. COST OF INLET INSERT SHALL BE INCLUDED IN THE PRICE BID FOR INLET.

3. ALL WELDS SHALL BE PERFORMED IN ACCORDANCE WITH APPROPRIATE AWS SPECIFICATIONS AND PROCEDURES.

4. ALL STEEL SHALL BE 7 GAGE OR 3/16\"/>

5. ALL WELDS ON EXPOSED SURFACES SHALL BE DRESSED SO AS TO PROVIDE A PLEASING FINISHED APPEARANCE.

6. THE ENTIRE FRAME SHALL BE HOT DIP ZINC COATED IN ACCORDANCE WITH ASTM A-123.

CAST IN PLACE CONCRETE NOTES

1. ALL CONCRETE SHALL BE CLASS A, AS DESIGNATED IN SECTION 509 OF THE ODOT SPECIFICATIONS, LATEST EDITION.

2. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4\"/>

3. CLEAR DISTANCES FROM CAST-IN-PLACE CONCRETE SURFACES TO REINFORCING SHALL BE 2\"/>

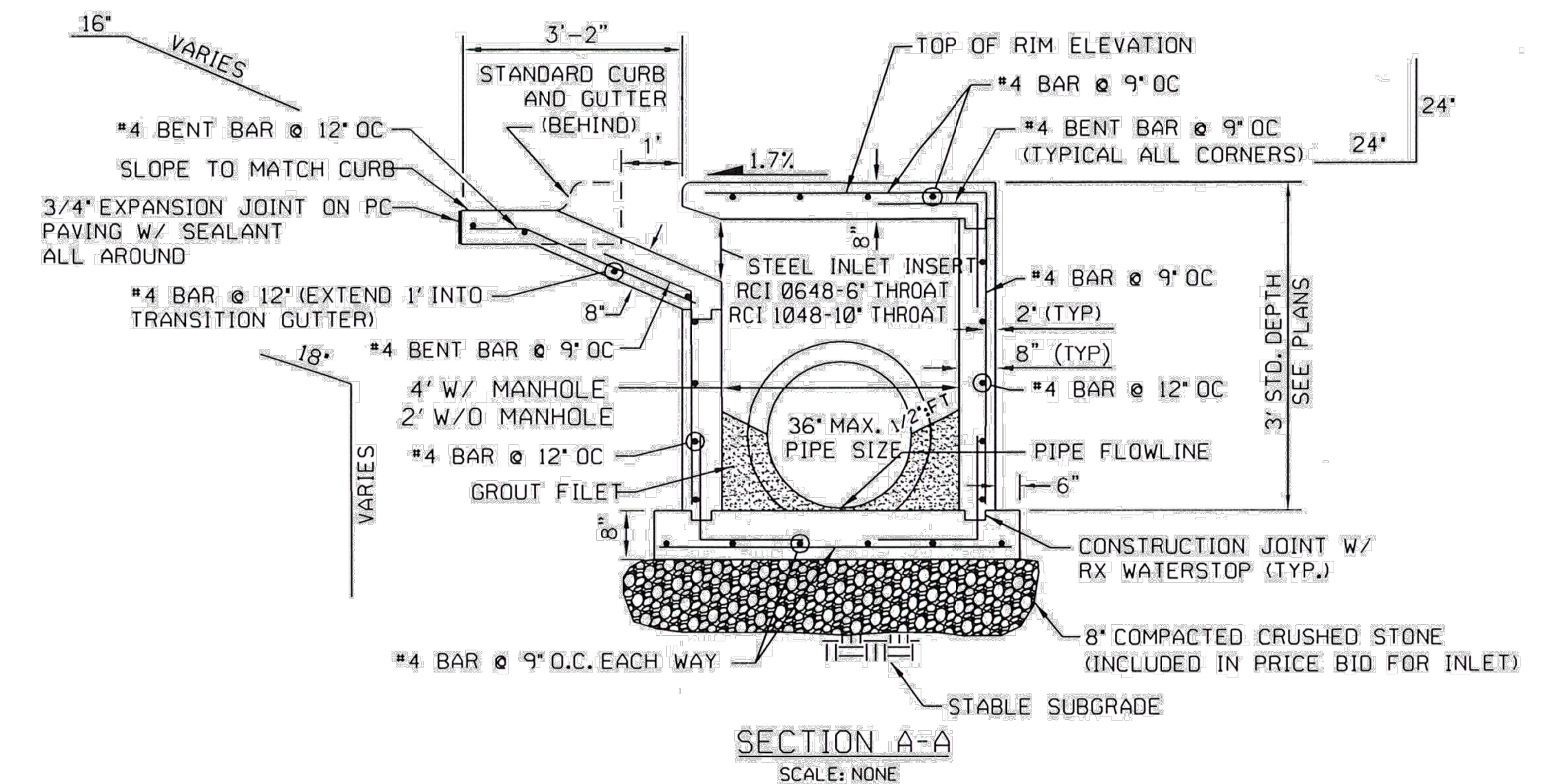
4. REINFORCING STEEL SHALL MEET ASTM SPECIFICATION A615, GRADE 60.

5. ALL BARS SHALL LAP A MINIMUM OF 30 BAR DIAMETERS OR 18\", WHICHEVER IS GREATER, UNLESS OTHERWISE NOTED BY THE ENGINEER.

6. ALL EXPOSED CAST IN PLACE CONCRETE SURFACES SHALL HAVE ALL VOIDS FILLED, BURRS AND FINS REMOVED.

7. ALL JOINTS SHALL BE SEALED WITH AN APPROVED SILICONE SEALANT.

8. MINIMUM CONCRETE COVER OF REINFORCING STEEL SHALL CONFORM TO AMERICAN CONCRETE INSTITUTE STANDARD OR BE 2\"/>



SECTION A-A
SCALE: NONE

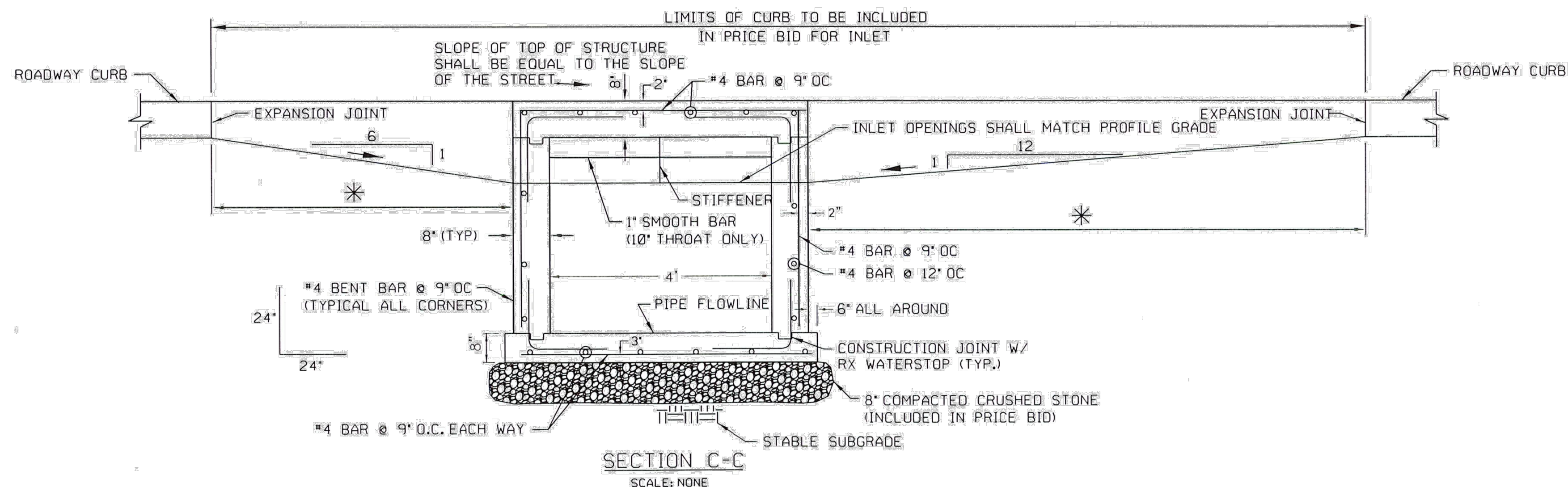
NOTE:
RCI STRUCTURES W/O MANHOLES SHOULD BE LIMITED TO CASES WHERE A SINGLE INLET IS EXTENDED BEYOND A JUNCTION BOX.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611.06 (G)	INLET, TYPE "RCI 0648 & RCI 1048"	EA.
611.06 (H)	ADDITIONAL DEPTH IN INLET TYPE "RCI 0648 & RCI 1048" V.F.	

NOTE:
DETAIL SHOWN WITH MANHOLE

	RCI 0648 (6\"/>
--	-----------------

	RCI 1048 (10\"/>
--	------------------



SECTION C-C
SCALE: NONE

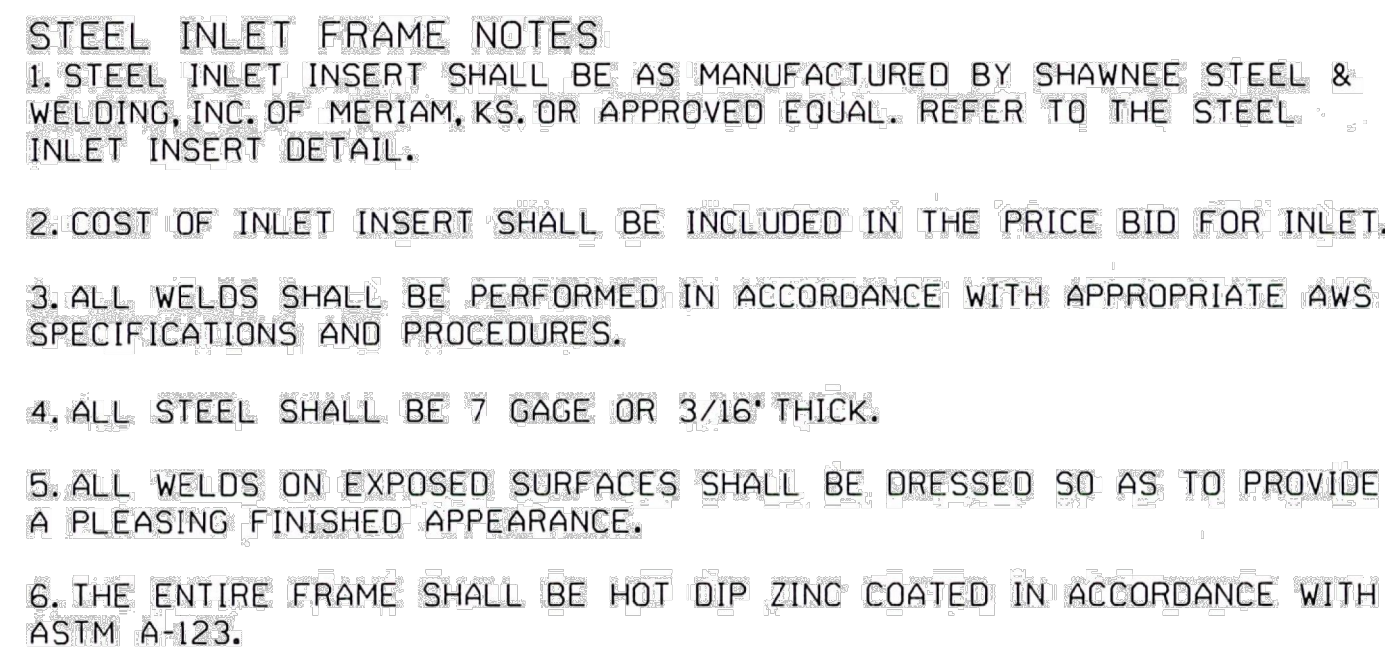
ENGINEERING DIVISION, CITY OF NORMAN

RECESSED CURB INLET A

APPROVED BY: _____
CITY ENGINEER

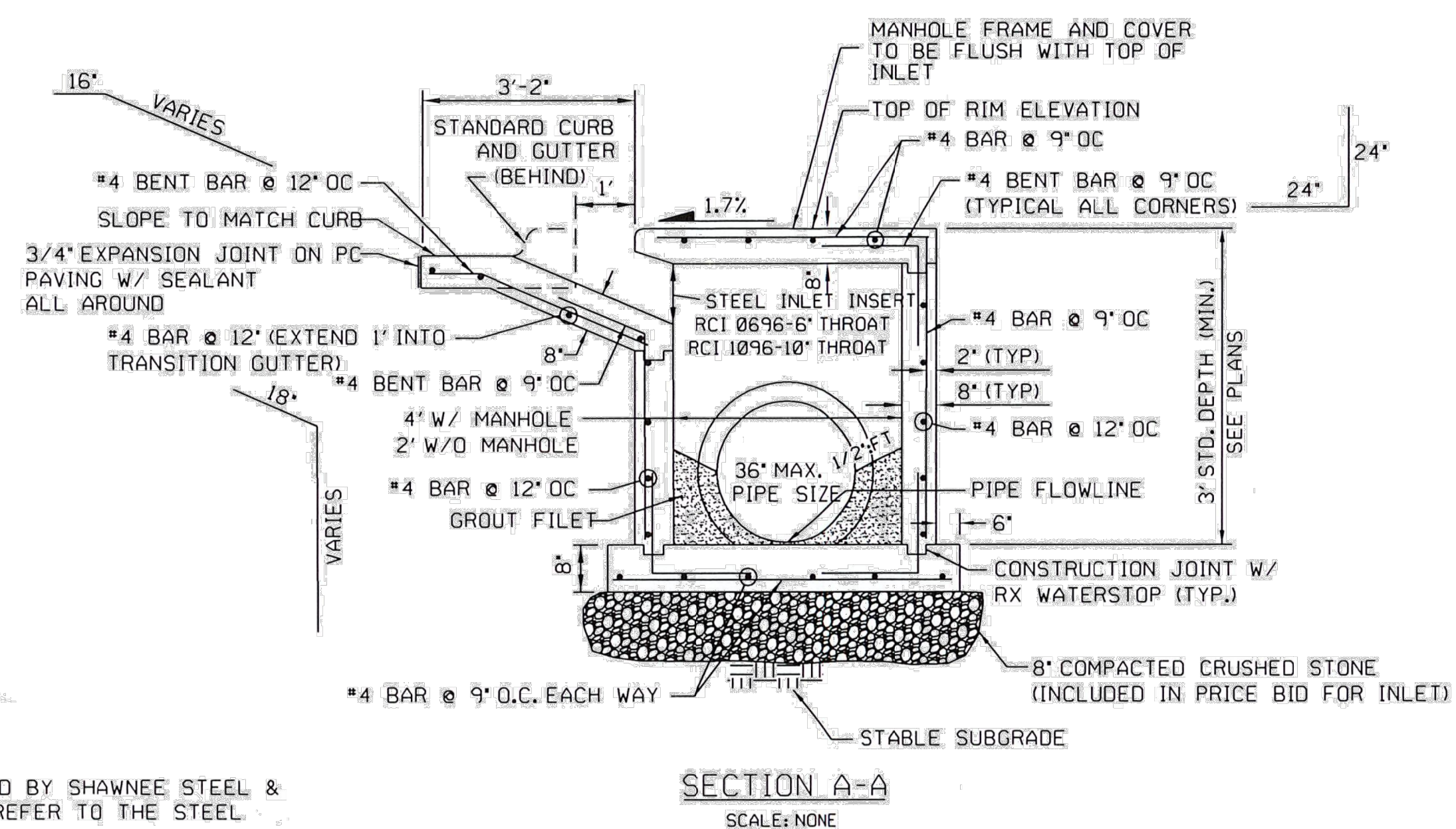
DATE: 01/2023

DRAWING NO: SD 21A



CAST IN PLACE CONCRETE NOTES

1. ALL CONCRETE SHALL BE CLASS A, AS DESIGNATED IN SECTION 509 OF THE ODOT SPECIFICATIONS, LATEST EDITION.
2. ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
3. CLEAR DISTANCES FROM CAST-IN-PLACE CONCRETE SURFACES TO REINFORCING SHALL BE 2" FOR WALLS, 1-1/2" FOR SUPPORTED SLABS, 3" FROM THE BOTTOM OF FOOTINGS AND 2" FROM THE TOP OF SLABS, UNLESS OTHERWISE NOTED.
4. REINFORCING STEEL SHALL MEET ASTM SPECIFICATION A615, GRADE 60.
5. ALL BARS SHALL LAP A MINIMUM OF 30 BAR DIAMETERS OR 18", WHICHEVER IS GREATER, UNLESS OTHERWISE NOTED BY THE ENGINEER.
6. ALL EXPOSED CAST IN PLACE CONCRETE SURFACES SHALL HAVE ALL VOIDS FILLED, BURRS AND FINIS REMOVED.
7. ALL JOINTS SHALL BE SEALED WITH AN APPROVED SILICONE SEALANT.
8. MINIMUM CONCRETE COVER OF REINFORCING STEEL SHALL CONFORM TO AMERICAN CONCRETE INSTITUTE STANDARD OR BE 2" FOR EXTERIOR WALL STEEL OR 3" FOR THE BOTTOM FLOOR STEEL.

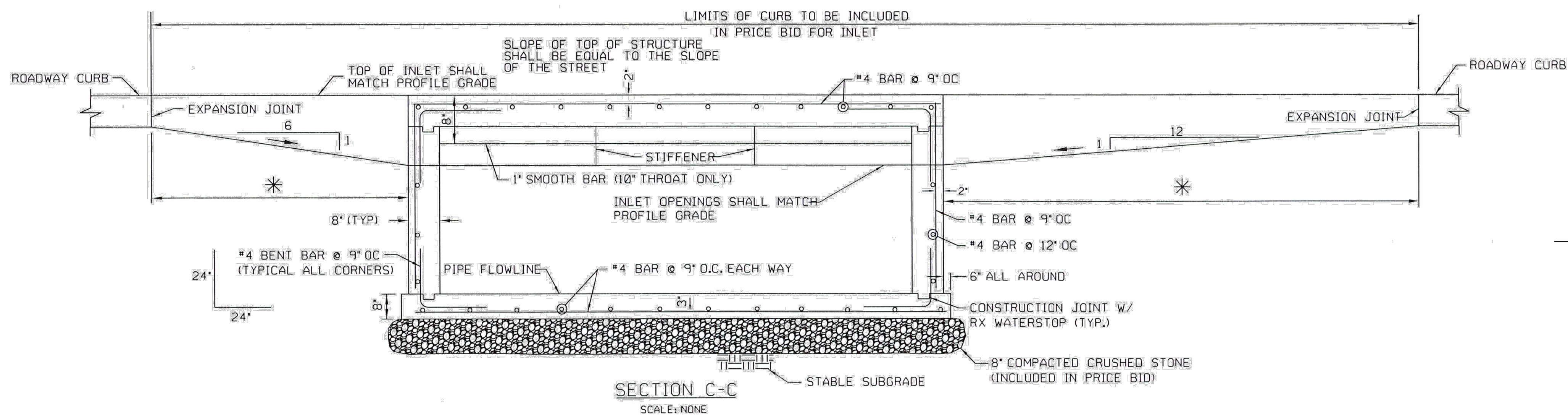


NOTE:
RCI STRUCTURES W/O MANHOLES SHOULD BE LIMITED TO CASES WHERE A SINGLE INLET IS EXTENDED BEYOND A JUNCTION BOX.

BASIS OF PAYMENT		
ITEM NO.	ITEM	UNIT
611.06 (G)	INLET, TYPE 'RCI 0696 & RCI 1096'	EA.
611.06 (H)	ADDITIONAL DEPTH IN INLET TYPE 'RCI 0696 & RCI 1096'	V.F.

		NOTE: DETAIL SHOWN WITH MANHOLE RCI 0696 (6" THROAT)							
		SUMP W/ MANHOLE		SUMP W/O MANHOLE		NO SUMP W/ MANHOLE		NO SUMP W/O MANHOLE	
		CONC. CY	STL. LBS.	CONC. CY	STL. LBS.	CONC. CY	STL. LBS.	CONC. CY	STL. LBS.
STD. DEPTH 3'	5.3	451		.4	268	5.6	457	4.2	275
ADD. VERT. FT.	1.3	45		.8	38	1.3	45	.8	38

RCI 1096 (10" THROAT)								
	SUMP W/ MANHOLE		SUMP W/O MANHOLE		NO SUMP W/ MANHOLE		NO SUMP W/O MANHOLE	
	CONC. CY	STL. LBS.	CONC. CY	STL. LBS.	CONC. CY	STL. LBS.	CONC. CY	STL. LBS.
STD. DEPTH 3'	5.7	464	4.3	281	6.1	477	4.7	295
ADD. VERT. FT.	1.3	45	.8	38	1.3	45	.8	38



ENGINEERING DIVISION, CITY OF NORMAN

RECESSED CURB INLET B

APPROVED BY: _____
CITY ENGINEER

DATE: 01/2023

DRAWING NO: SD 21A

TABLE OF CONTENTS

DRAWING NUMBER	DRAWING TITLE	REVISION DATE
SS 01	SANITARY PIPE TRENCHING AND BEDDING	01/2023
SS 02	PRECAST "SHALLOW" MANHOLE	01/2023
SS 03	CAST IN PLACE MANHOLE	01/2023
SS 04	MANHOLE FRAME AND COVER	01/2023
SS 04B	SANITARY SEWER MANHOLE COVER	01/2023
SS 04C	REVERSIBLE SANITARY SEWER MANHOLE FRAME	01/2023
SS 04D	REVERSIBLE SANITARY SEWER MANHOLE FRAME	01/2023
SS 04E	SANITARY SEWER MANHOLE COVER	01/2023
SS 04F	BOLT DOWN SANITARY SEWER MANHOLE FRAME & COVER	01/2023
SS 05	MANHOLE CONNECTIONS	01/2023
SS 06	WATER TABLE CRADLE FOR FLEXIBLE PIPE	01/2023
SS 07A	TAPPING A SANITARY SEWER LINE	01/2023
SS 08	SANITARY SEWER TEE AND RISER	01/2023
SS 10	SANITARY SEWER TAP AT MANHOLE	01/2023
SS 11	SANITARY SEWER AIR RELIEF VALVE	01/2023
SS 13	SUBMERSIBLE LIFT STATION	01/2023
SS 14	6" SEWER SERVICE CONNECTION INSTALLATION	01/2023

TABLE OF CONTENTS - SANITARY SEWER

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

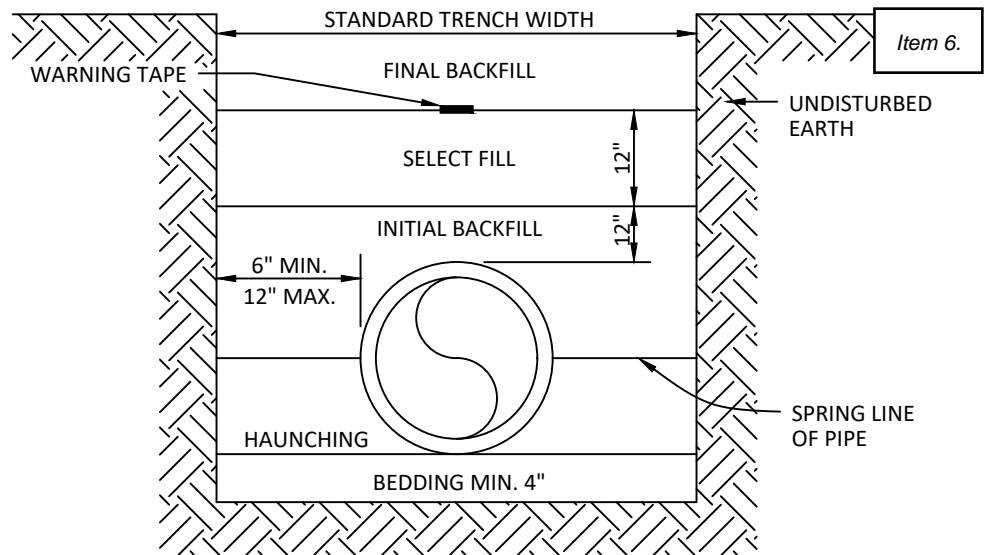
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 00

DRAWING NO. SS 00

PIPE DIA.	DESIGN GRADE
6 IN	0.75%
8 IN	0.50%
12 IN	0.29%
15 IN	0.22%
18 IN	0.17%
21 IN	0.14%
24 IN	0.12%



TRENCHING MATERIALS				
BACKFILL DESCRIPTION	NON-PAVED AREAS		PAVED AREAS (SEE NOTE 7)	
	PVC	HDPE/FRP	PVC	HDPE/FRP
FINAL BACKFILL	EXCAVATED MATERIAL	EXCAVATED MATERIAL	SBM	SBM
SELECT BACKFILL	SELECT FILL	SELECT FILL	SBM	SBM
INITIAL BACKFILL	SAND	SAND	SAND	SAND
HAUNCHING	SAND	SAND	SAND	SAND
BEDDING	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5	SEE NOTE 5

NOTES

1. INSTALLATION FOR PVC PIPE SHALL MEET THE REQUIREMENTS OF ASTM D2321.
2. SELECT FILL CONSISTS OF EXCAVATED MATERIALS CONTAINING NO ROCKS LARGER THAN 2-INCHES.
3. STANDARD BACKFILL MATERIAL (SBM) SHALL CONFORM TO ODOT 703.01, TYPE A AGGREGATE BASE, OR FLOWABLE FILL PER ODOT SECTION 701.19.
4. THE MINIMUM DEPTH OF EARTH COVER IS 30-INCHES.
5. COMPACTION REQUIREMENTS:
 - A. NON- PAVED AREAS: 90% MAXIMUM STANDARD PROCTOR DENSITY FOR COHESIONLESS SOILS AND 85% FOR COHESIVE SOILS.
 - B. PAVED AREAS: 95% MAXIMUM STANDARD PROCTOR DENSITY FOR COHESIONLESS SOILS.
6. IF TRENCH IS DRY BEDDING SHALL BE 4-INCH TYPE A AGGREGATE BASE, AND IF WET SHALL BE NO. 57 OR NO. 67 ROCK PER ODOT SECTION 701.06. IF POOR SOIL CONDITIONS ARE ENCOUNTERED, DEPTH SHALL BE OVER EXCAVATED AND STABILIZED WITH AGG BASE.
7. WITH APPROVAL FROM UTILITIES ENGINEER, WATER JETTING MAY BE ALLOWED IN OPEN TRENCHING, BUT NOT UNDER EXISTING OR PROPOSED PAVEMENT.
8. THE BACKFILL MATERIAL SHALL EXTEND A MINIMUM OF 2-FEET BEHIND THE BACK OF CURB, OR THE EDGE OF PAVEMENT WHERE NO CURB EXISTS.
9. WARNING TAPE SHALL BE INSTALLED ABOVE ALL NEW UNDERGROUND PIPING AFTER PLACEMENT OF SELECT BACKFILL AS PER SPECIFICATION 2506.1(J).
10. CONCRETE CRADLE SHALL BE USED WHEN SEWER DEPTH EXCEEDS 16-FEET.
11. ONE(1) CLAY PIPE PLUG OR WATER DAM IS REQUIRED BETWEEN EACH MANHOLE. CLAY DAM SHALL BE THE FULL WIDTH OF THE TRENCH, 5-FEET LONG, AND EXTENDED A MINIMUM OF 24-INCHES ABOVE THE TOP OF THE SEWER MAIN.
12. PIPELINES INSTALLED AT SLOPES GREATER THAN 20% SHALL BE ANCHORED EVERY 16-FEET.

SANITARY PIPE TRENCHING AND BEDDING

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

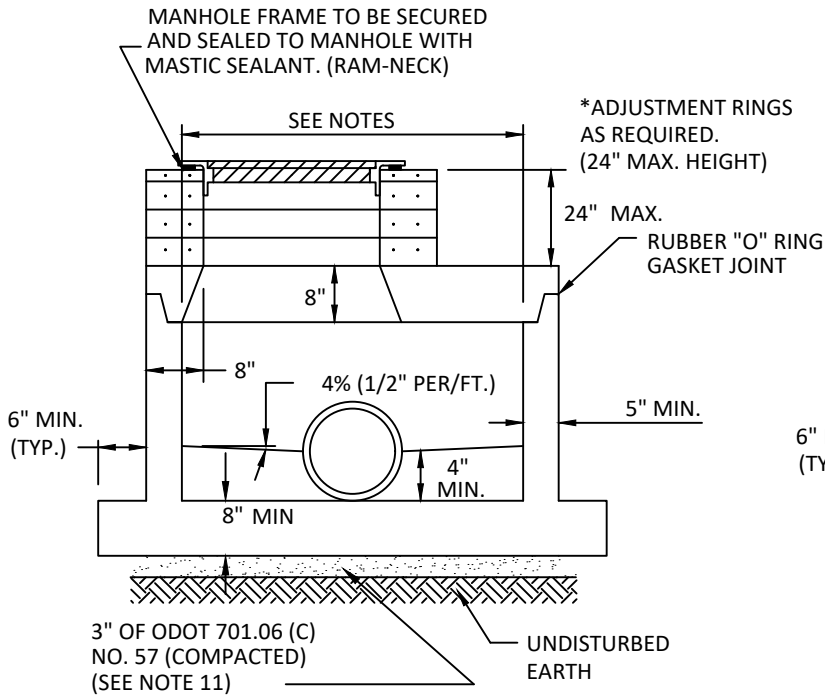
APPROVAL DATE:

REVISION DATE: 01/2023

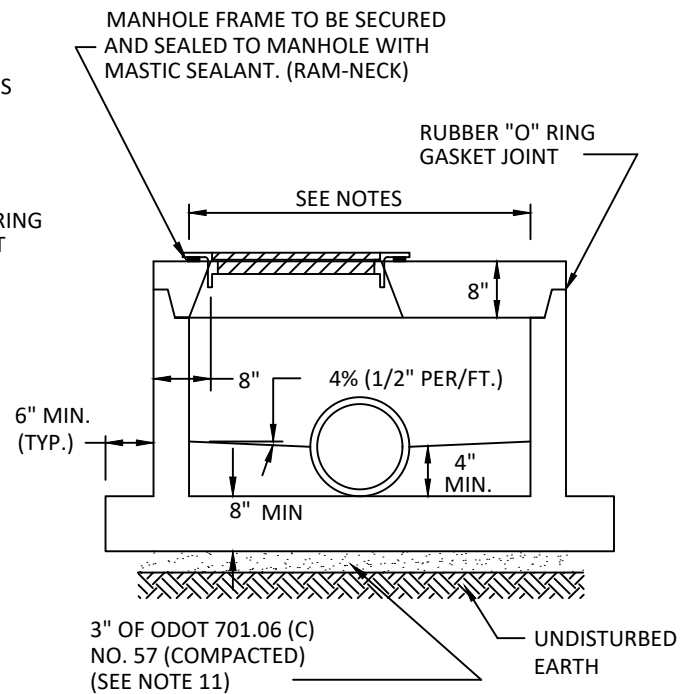
REV. NO. 07

DRAWING NO. SS 01

390

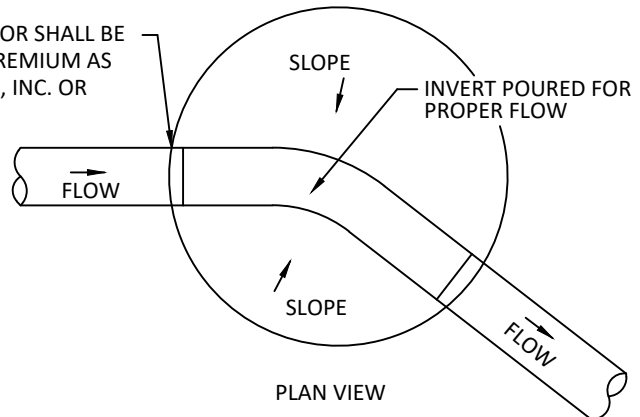


(FLAT TOP)
(WITH ADJUSTMENT RINGS)



(FLAT TOP)
(NO ADJUSTMENT RINGS)

FLEXIBLE PIPE TO MANHOLE CONNECTOR SHALL BE PROVIDED AT ALL OPENINGS. A-LOK PREMIUM AS MANUFACTURED BY A-LOK PRODUCTS, INC. OR APPROVED EQUAL.



NOTES:

1. MH SHALL CONFORM TO CURRENT ASTM C-478.
2. 8- TO 15-INCH PIPE, 4- FEET ID MANHOLE REQUIRED.
3. 18- TO 27-INCH PIPE, 5'-FEET ID MANHOLE REQUIRED.
4. OVER 27-INCH PIPE MANHOLE ID AS SPECIFIED BY ENGINEER.
5. MIN. CONCRETE STRENGTH TO BE ODOT CLASS A, 3,500 PSI @ 28 DAYS.
6. MANHOLE DEPTH IS VARIABLE, STANDARD MANHOLE DEPTH IS 6'-0".
7. CAST IN PLACE MANHOLES MAY ONLY BE USED WITH WRITTEN PERMISSION OF THE OWNER.
8. MANHOLES LESS THAN 4'-6" IN HEIGHT SHALL HAVE A FULL 4- FEET ID OR LARGER FROM TOP TO BOTTOM.
9. IN ASPHALT STREETS, MANHOLES SHALL HAVE 4- FEET BY 4- FEET BY 8- INCHES CONCRETE COLLARS W/4-#5 DEFORMED REINFORCING BARS.
10. ALL BACKFILL MATERIAL USED AROUND MANHOLE SHALL BE MECHANICALLY TAMPED IN 12"-INCH LIFTS.
11. IF POOR SOIL CONDITIONS ARE ENCOUNTERED, DEPTH SHALL BE OVER EXCAVATED AND STABILIZED WITH ODOT 701.06 NO. 57 OR 67 ROCK.
12. IF MANHOLE IS IN THE STREET THE FRAME SHALL BE INVERTED UP AS SHOWN ON SSO4c SECTION/INVERTED DETAIL.
13. MANHOLE FRAME SHALL BE INVERTED INSIDE THE MANHOLE OR ADJUSTMENT RINGS AND SEALED WITH MASTIC SEALANT (RAM-NECK).
14. 2- OR 4-INCH REINFORCED CONCRETE CONCENTRIC ADJUSTMENT RINGS AS FINISH GRADE REQUIRES, SECURED & SEALED WITH RUBBER RINGS OR MASTIC (RAM-NECK).
15. TOP OF MANHOLE FRAME TO BE 2 1/2-INCHES ABOVE THE SURROUNDING GROUND (TYP.)

PRECAST "SHALLOW" MANHOLE

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

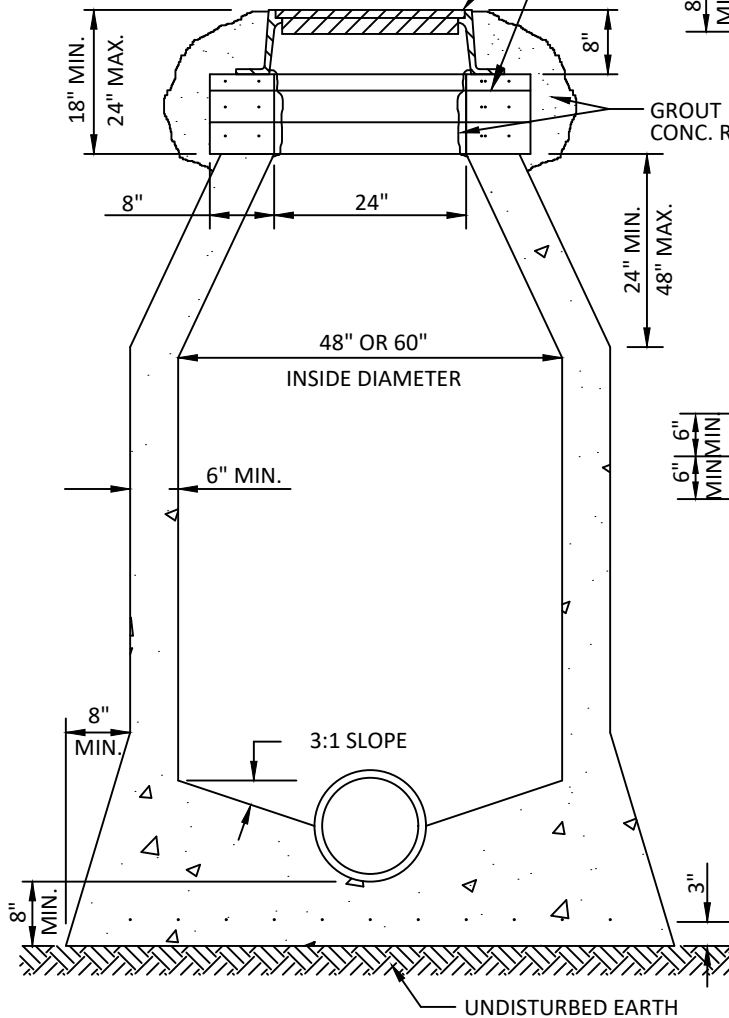
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REVISION DATE: 01/2023

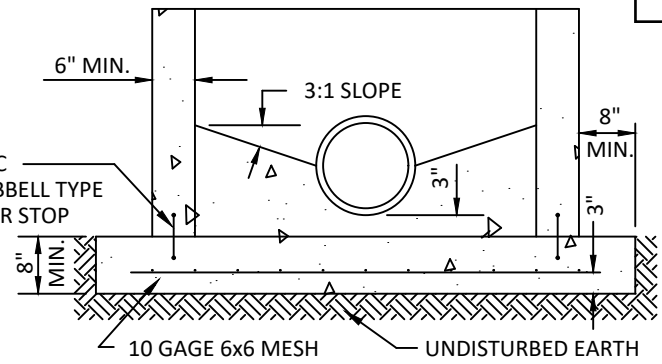
REV. NO. 01

DRAWING NO. SS 02

TOP OF MANHOLE RING TO BE 2 1/2"
ABOVE THE SURROUNDING GROUND

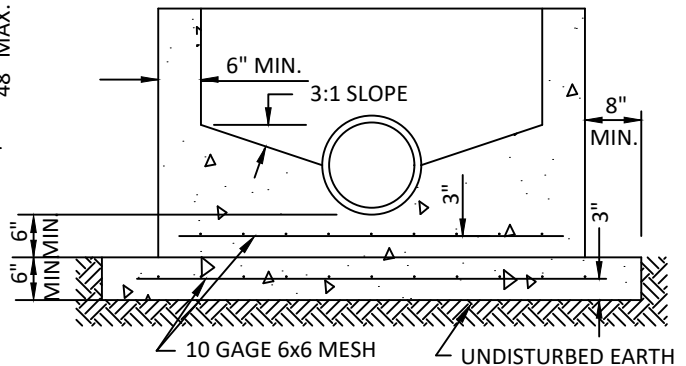


MONOLITHIC CONSTRUCTION



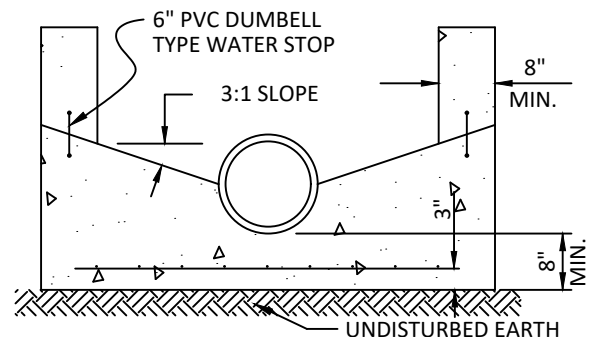
STAGE CONSTRUCTION

ALTERNATE 1



STAGE CONSTRUCTION

ALTERNATE 2



STAGE CONSTRUCTION

ALTERNATE 3

NOTES:

1. LOW SLUMP CONCRETE SHALL BE PLACED IN THE FOOTINGS AND LOWER WALLS, AND SHALL BE PLACED AND VIBRATED IN 12-INCH LIFTS.
2. AN INSPECTOR MUST BE PRESENT BEFORE AND DURING THE PLACING OF THE CONCRETE.
3. THIS MANHOLE SHALL NOT BE USED IN PAVED STREETS OR OTHER TRAVELED AREAS.
4. THE CONCRETE MUST SET FOR 48 HOURS BEFORE PIPE INSIDE OF MANHOLE IS TRIMMED.
5. ALTERNATE 3 INVERT MUST BE FORMED AT TIME OF BOTTOM POUR.
6. WATER STOPS MAY BE ELIMINATED IF BARREL OF MANHOLE IS POURED WITHIN 4 HOURS AFTER BASE IS CLEANED OF ALL MUD, SILT AND DEBRIS.
7. MIN. CONCRETE STRENGTH TO BE ODOT CLASS A, 3,500 PSI.
8. IN ASPHALT STREETS, MANHOLES SHALL HAVE 4-FEET BY 4-FEET BY 8-INCHES CONCRETE COLLAR W/4-#6 REINFORCING BARS.
9. 8- TO 18-INCH PIPE, 4-FEET ID MANHOLE REQUIRED.
10. 21- TO 27-INCH PIPE, 5-FEET ID MANHOLE REQUIRED.
11. OVER 27-INCH PIPE, MANHOLE I.D. SPECIFIED BY ENGINEER.

CAST IN PLACE MANHOLE

CITY ENGINEER APPROVAL:

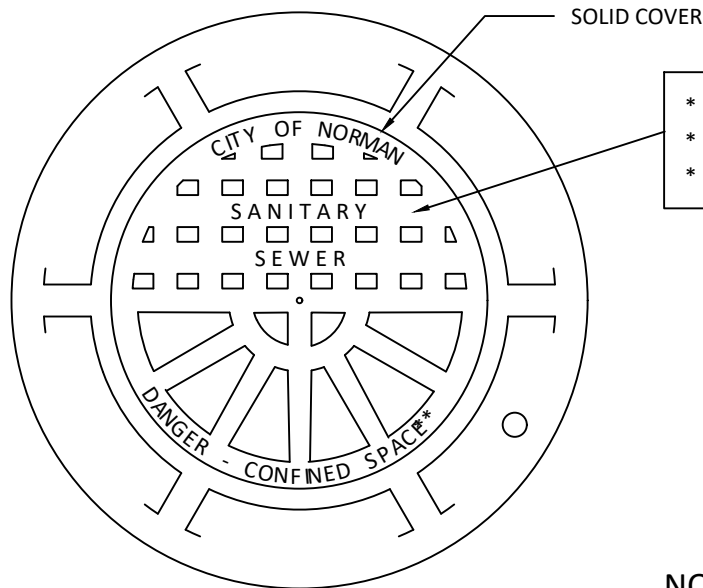
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 05

DRAWING NO. SS 03



LETTERING

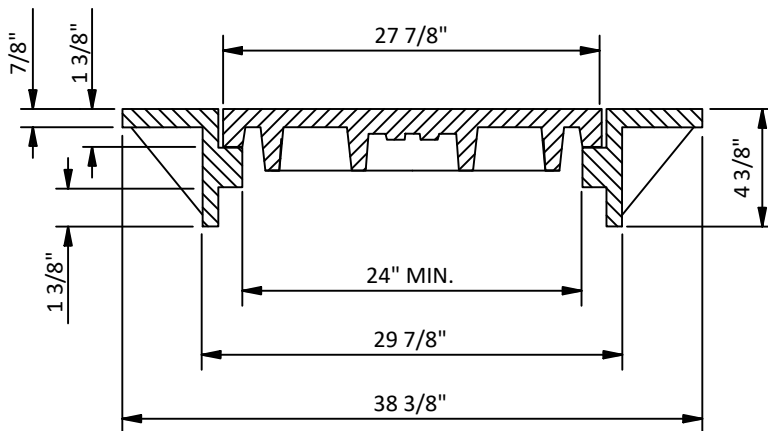
- * CITY OF NORMAN
- * SANITARY SEWER
- * CONFINED SPACE ADVISORY

NOTE:

1. ACCEPTABLE UNITS:

- A. NEENAH NO. R-1682
- B. WESTERN NO. 100
- C. POINT-A-MOUSSON NO. GTS, CLASS 400
- D. EAST JORDAN IRON WORKS 2100CSE

PLAN



SECTION

MANHOLE FRAME AND COVER

CITY ENGINEER APPROVAL:

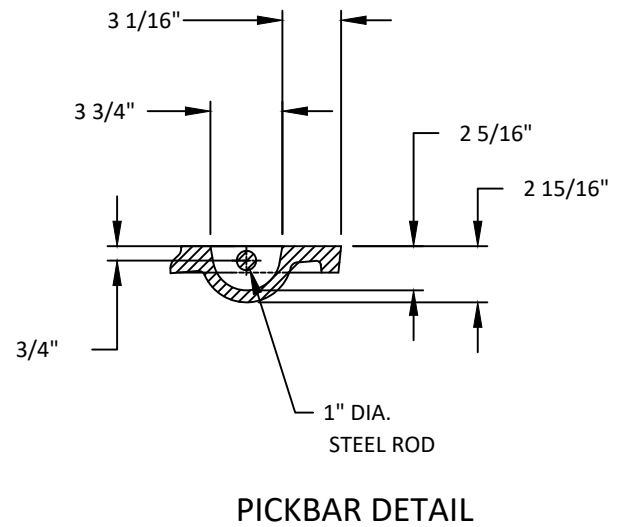
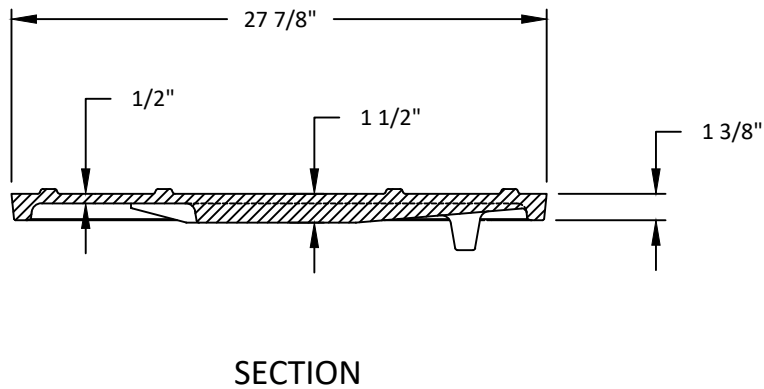
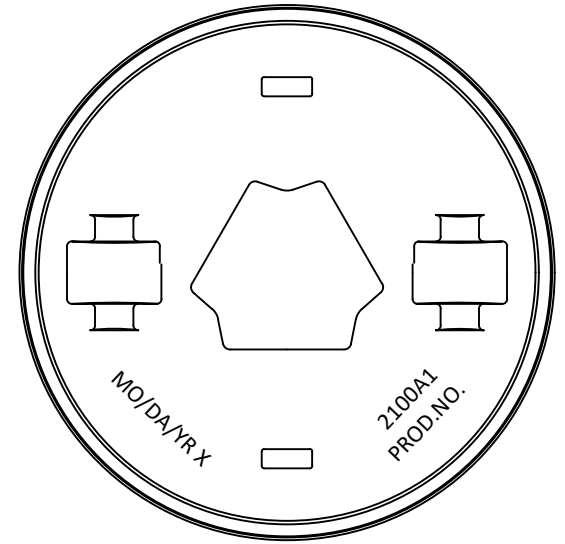
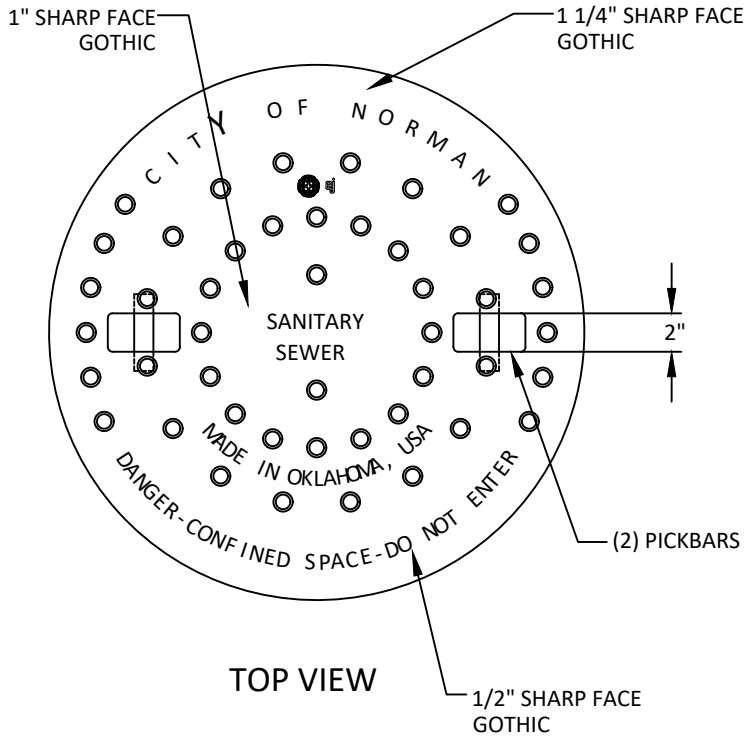
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 03

DRAWING NO. SS 04



SANITARY SEWER MANHOLE COVER

CITY ENGINEER APPROVAL:

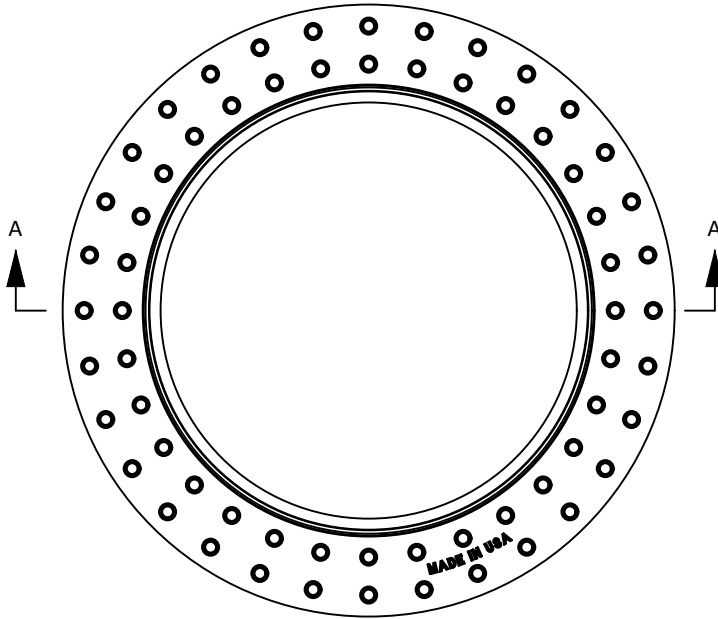
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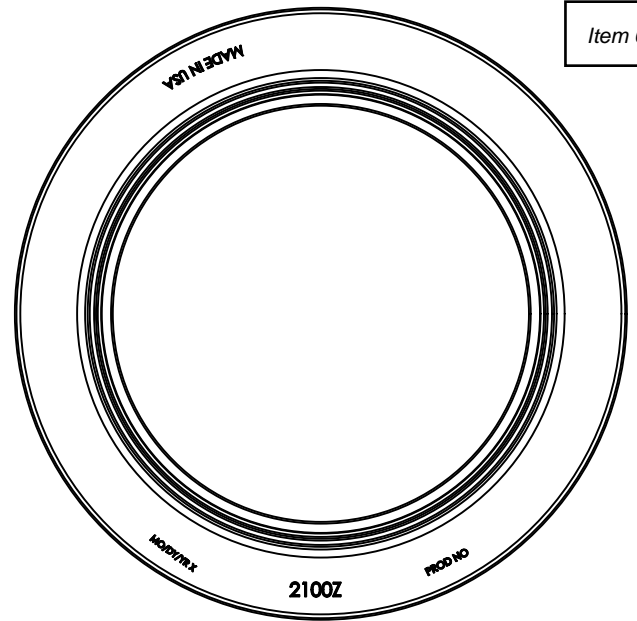
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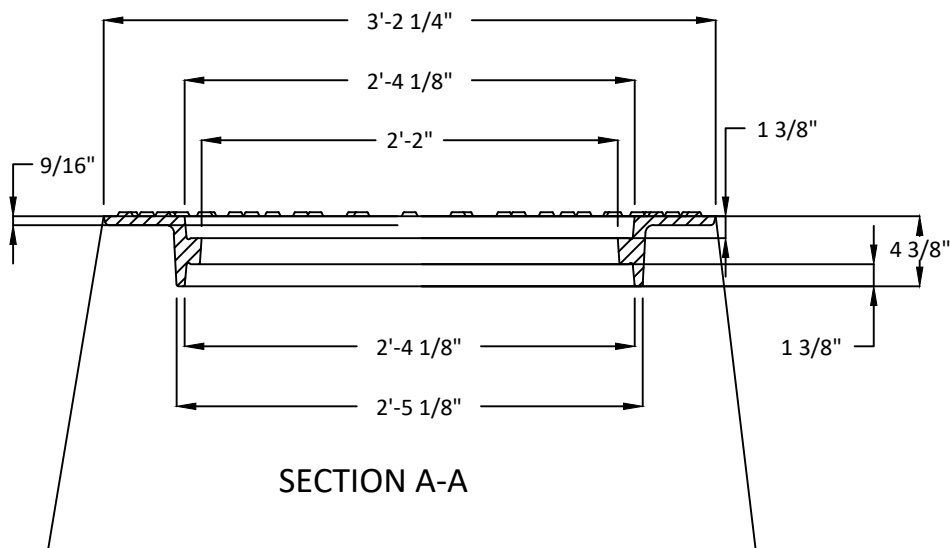
DRAWING NO. SS 04B



TOP FLANGE VIEW



BOTTOM FLANGE VIEW



SECTION A-A

NOTE:

1. RING IS REVERSIBLE, CAN BE INSTALLED AS BOTTOM FLANGE UNIT.

REVERSIBLE SANITARY SEWER MANHOLE FRAME

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

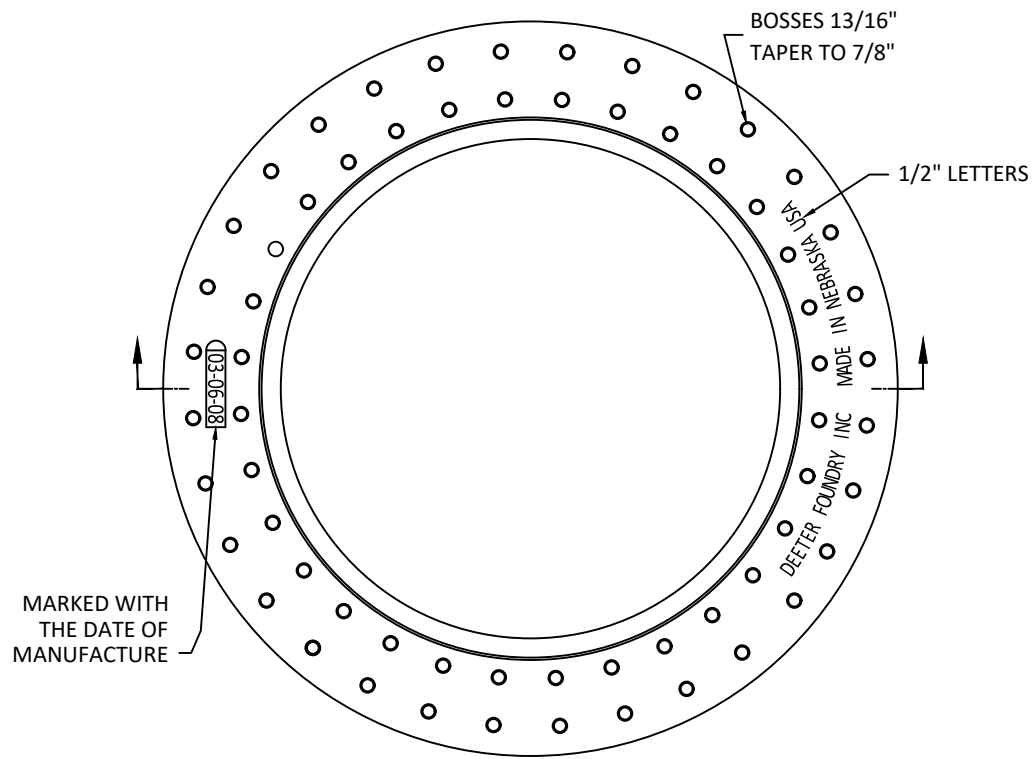
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REVISION DATE: 01/2023

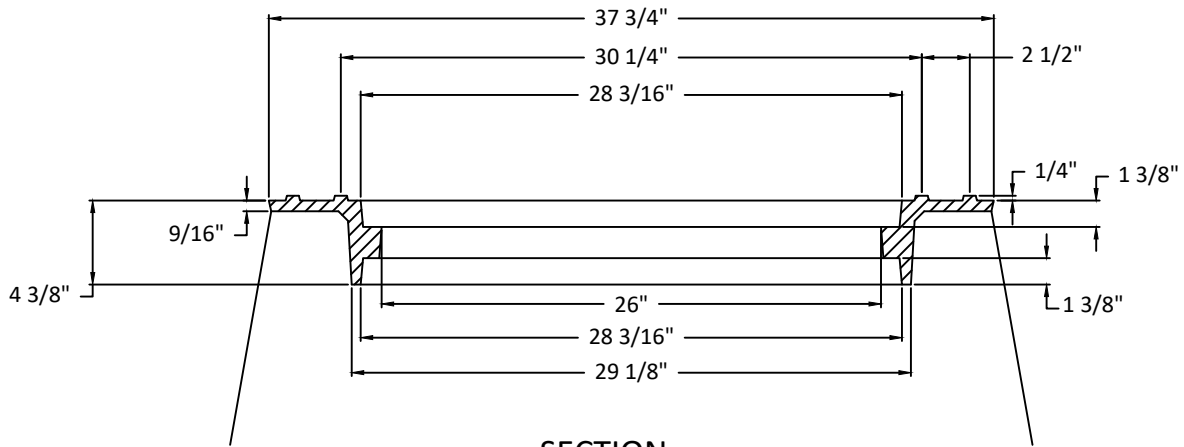
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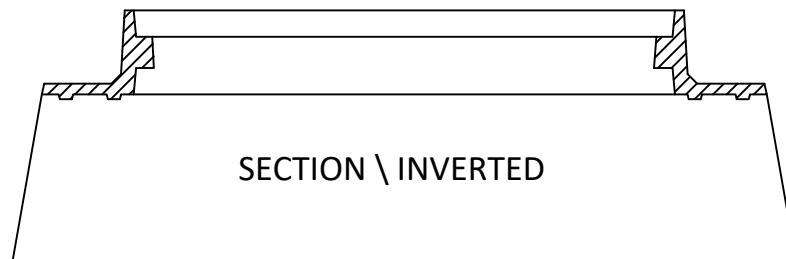
395



TOP VIEW



SECTION



SECTION \ INVERTED

REVERSIBLE SANITARY SEWER MANHOLE FRAME

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

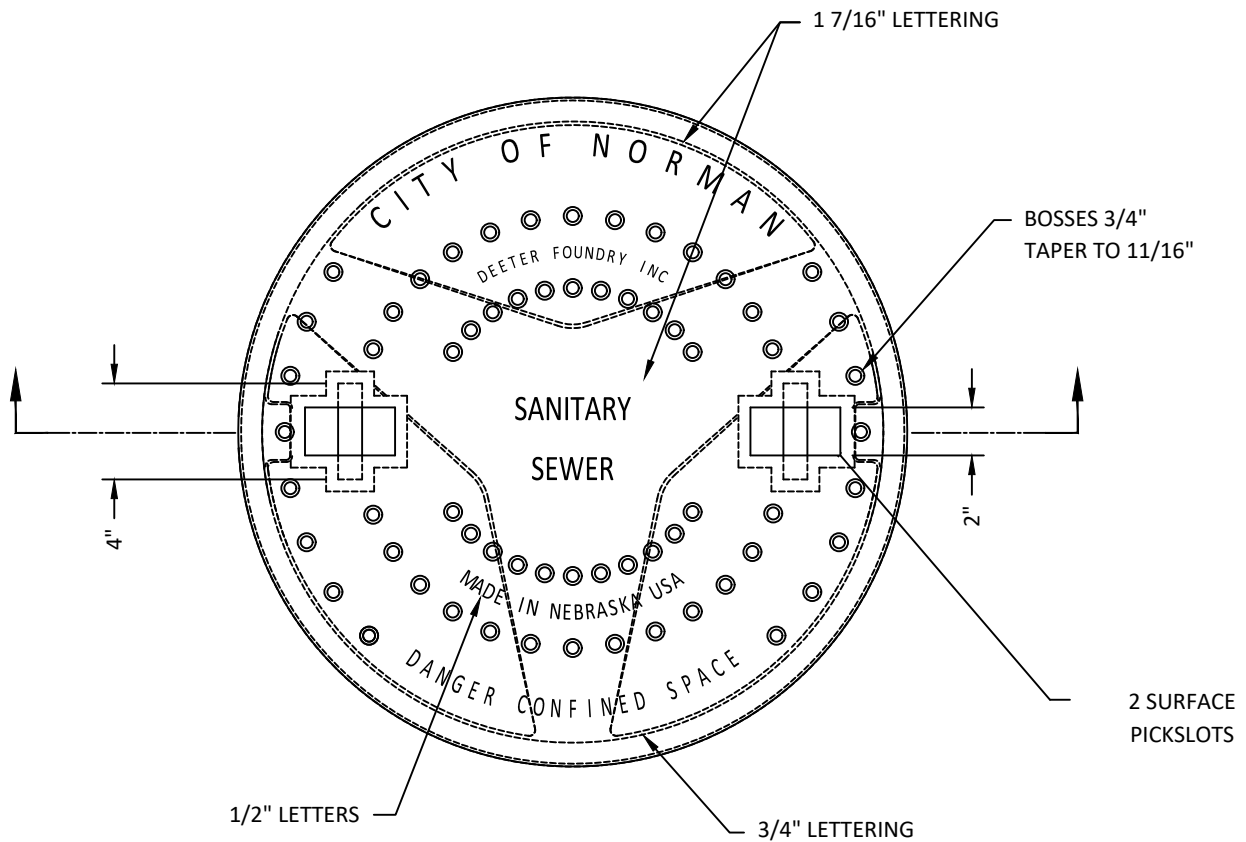
APPROVAL DATE:

REVISION DATE: 01/2023

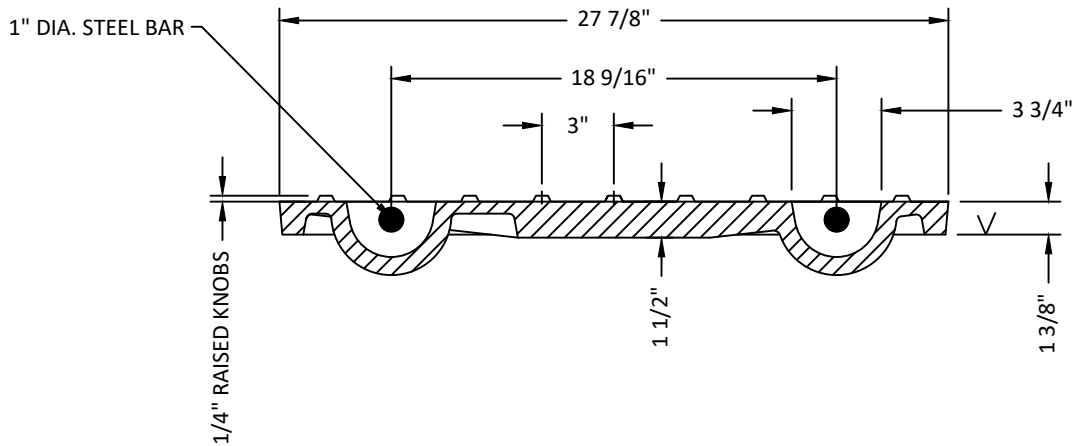
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DRAWING NO. SS 04D

396



TOP VIEW



SECTION

SANITARY SEWER MANHOLE COVER

CITY ENGINEER APPROVAL:

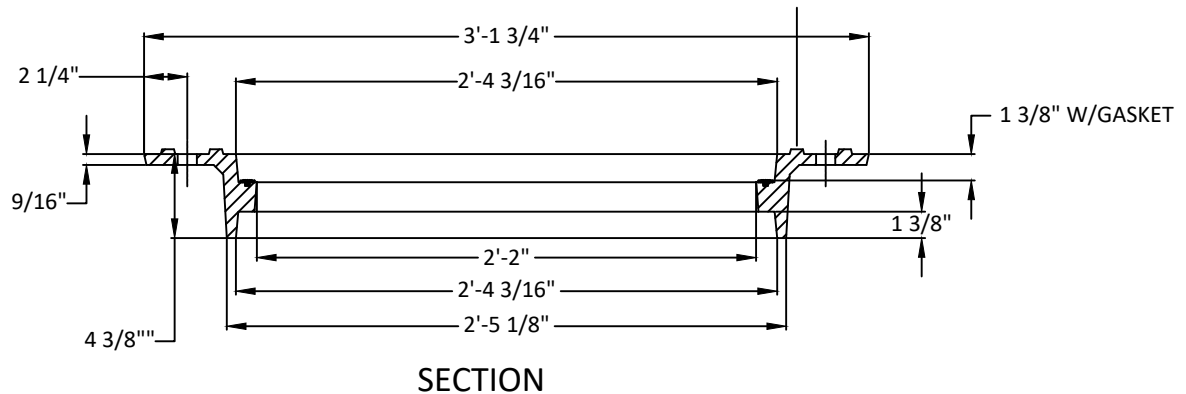
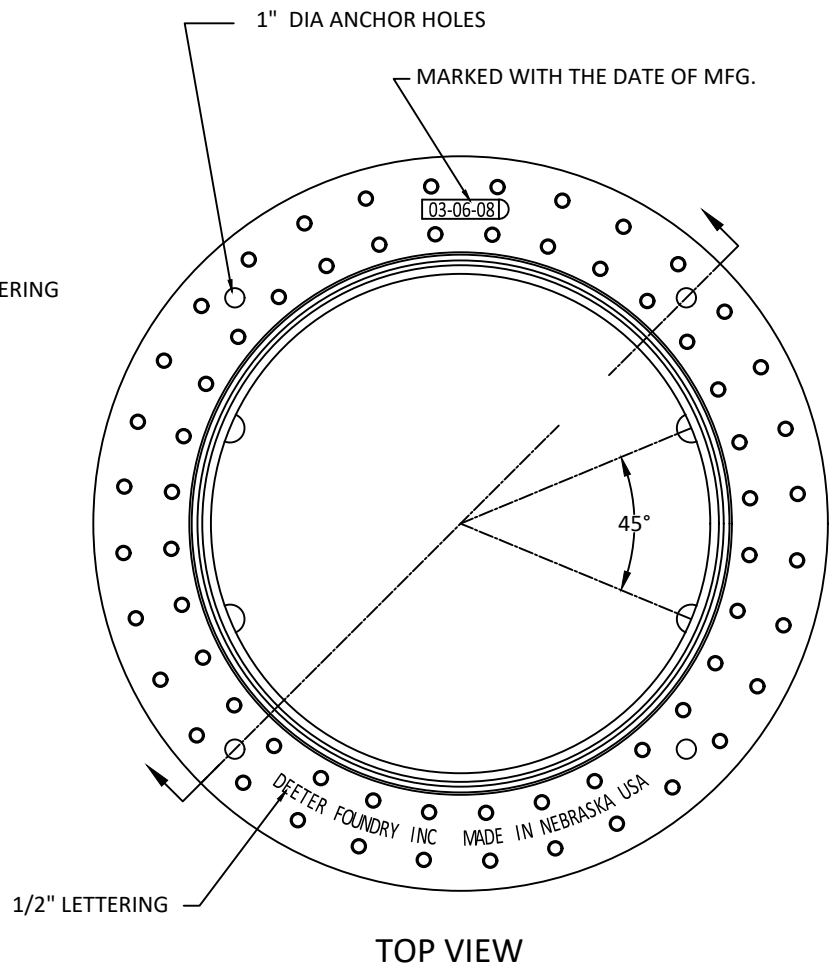
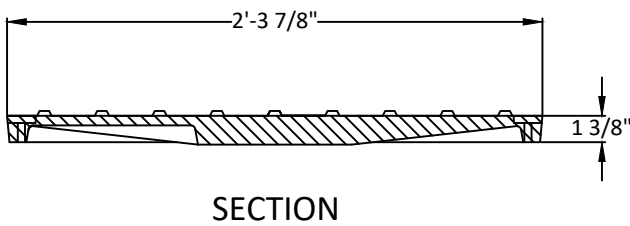
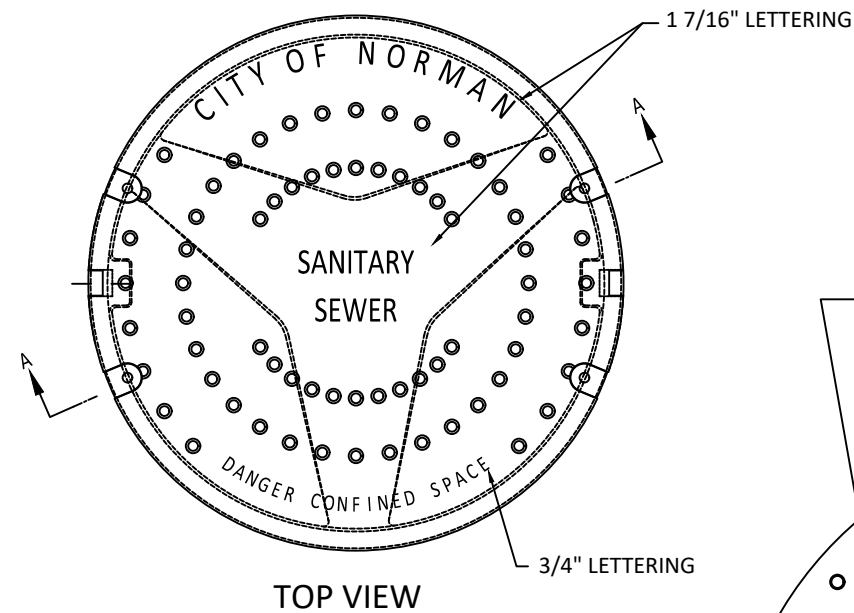
CITY OF NORMAN, OKLAHOMA

APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. SS 04E



BOLT DOWN SANITARY SEWER MANHOLE FRAME & COVER

CITY ENGINEER APPROVAL:

CITY OF NORMAN, OKLAHOMA

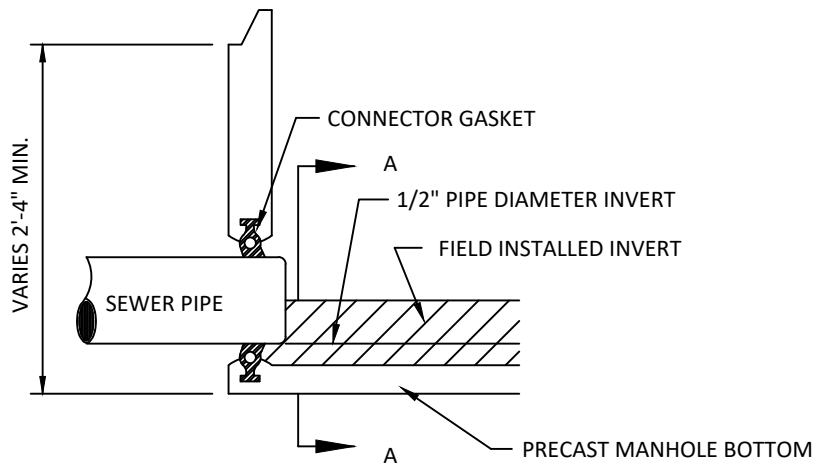
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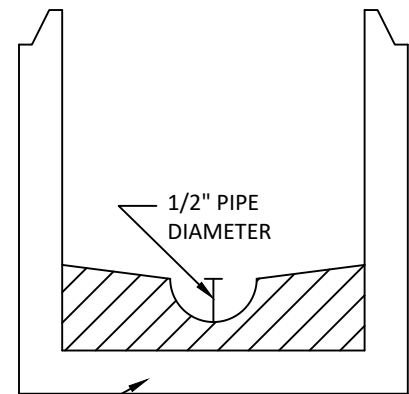
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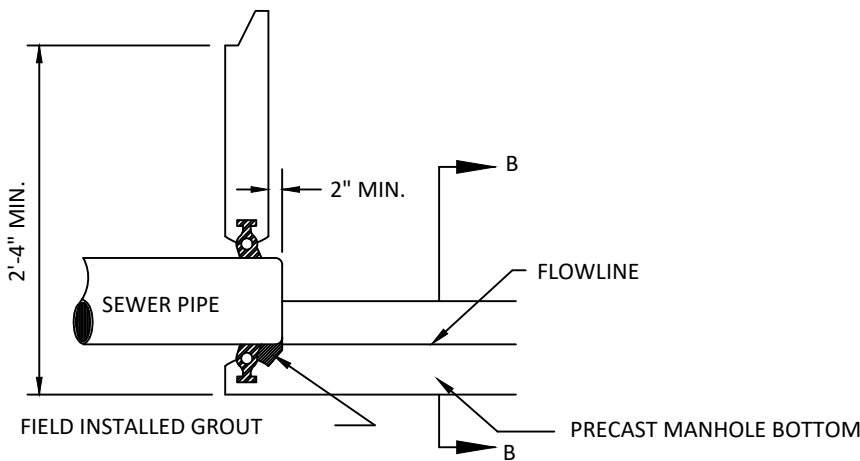
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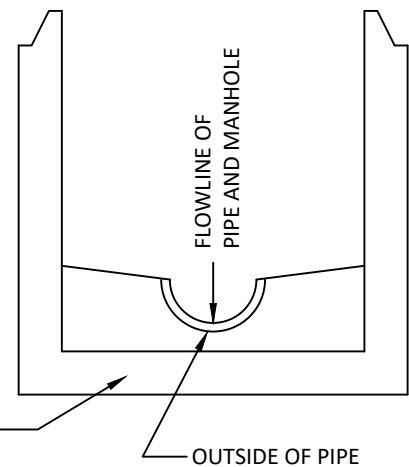
TYPE A MANHOLE



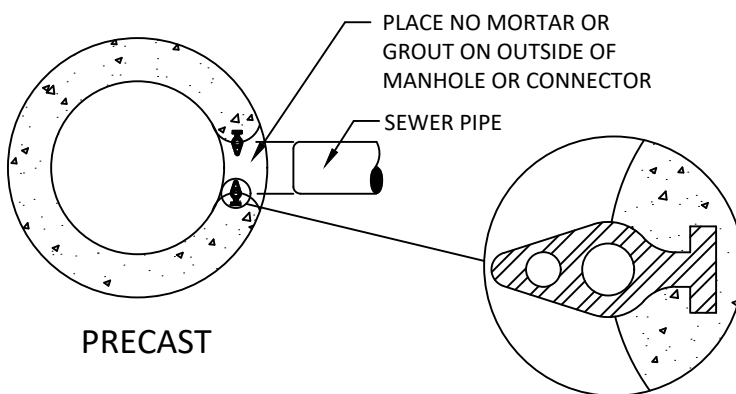
SECTION A-A



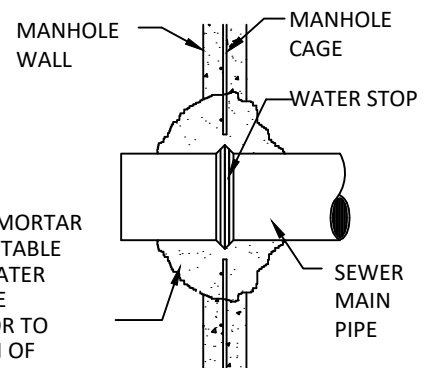
TYPE B MANHOLE



SECTION B-B



NON-SHRINK MORTAR OR OTHER SUITABLE MATERIAL. WATER STOP MUST BE VERIFIED PRIOR TO INSTALLATION OF NON-SHRINK GROUT.



INSTALLED IN THE FIELD

MANHOLE CONNECTIONS

CITY ENGINEER APPROVAL:

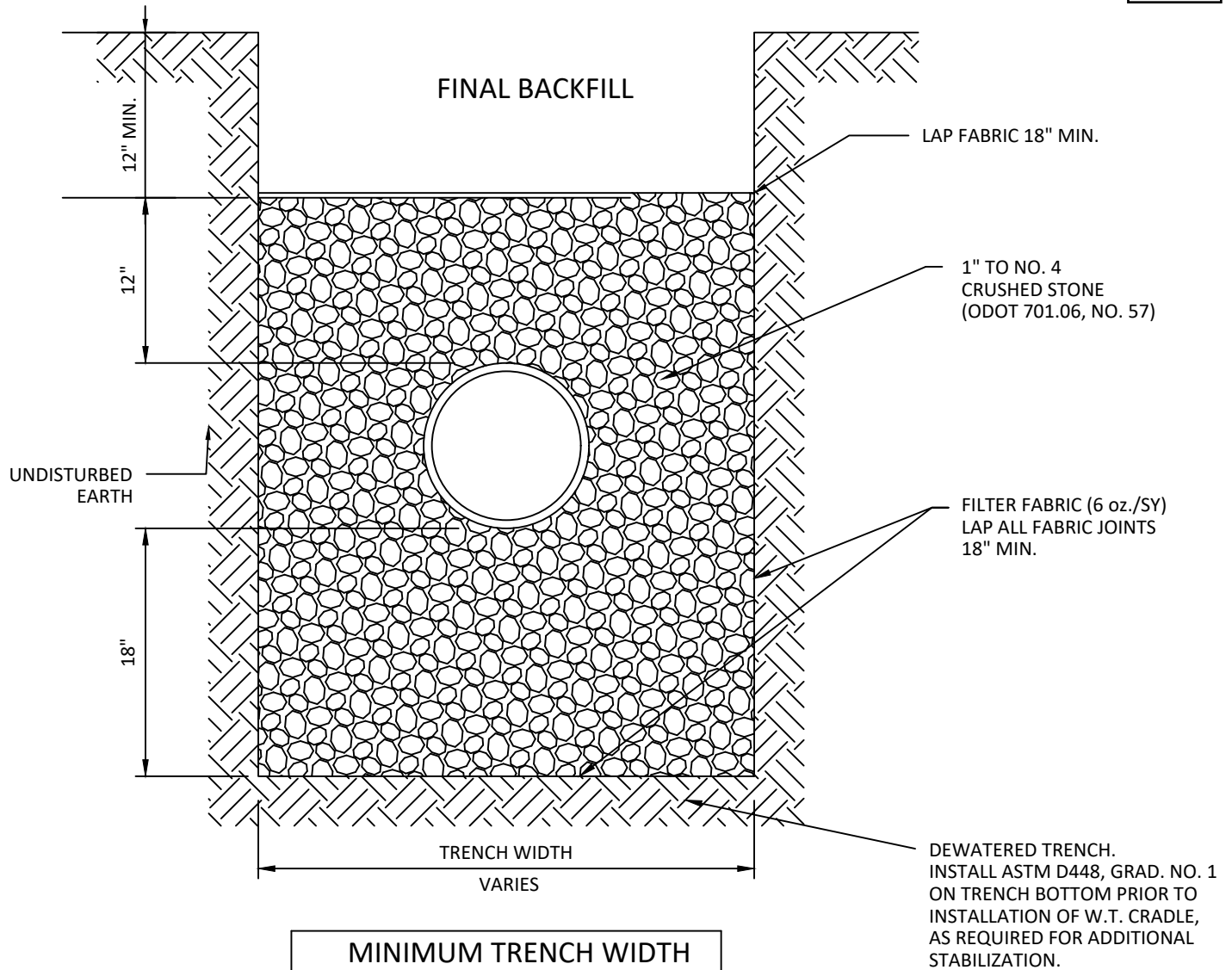
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APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 01

DRAWING NO. SS 05



MINIMUM TRENCH WIDTH FOR PVC PIPES

PIPE I.D.	MIN. TRENCH WIDTH
IN.	FT.
6" - 12"	3' - 0"
15" - 18"	4' - 6"
21" - 24"	6' - 0"

NOTES

1. NOT ALL OTHER PIPE MATERIALS, USE THE STANDARD TRENCH WIDTH (SS 01).
2. FOR ALL PIPES GREATER THAN 24-INCHES, TRENCH DESIGN SHALL BE APPROVED BY THE UTILITIES ENGINEER.
3. SLIDING TRENCH SUPPORTS SHALL NOT BE PLACED BELOW THE TOP OF PIPE. BACKFILL ABOVE WATER TABLE SHALL MATCH SS01.

WATER TABLE CRADLE FOR FLEXIBLE PIPE

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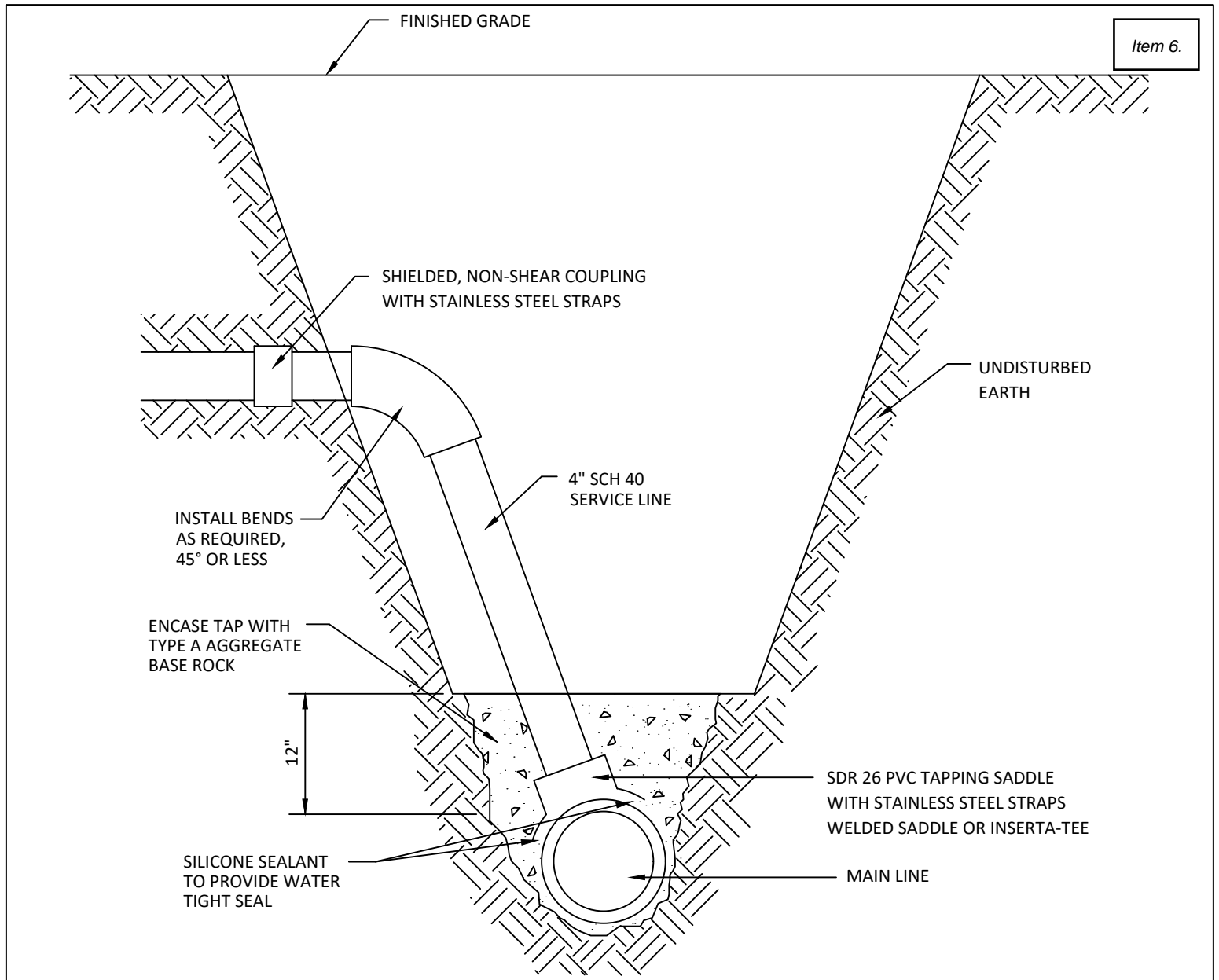
APPROVAL DATE:

REVISION DATE: 01/2023

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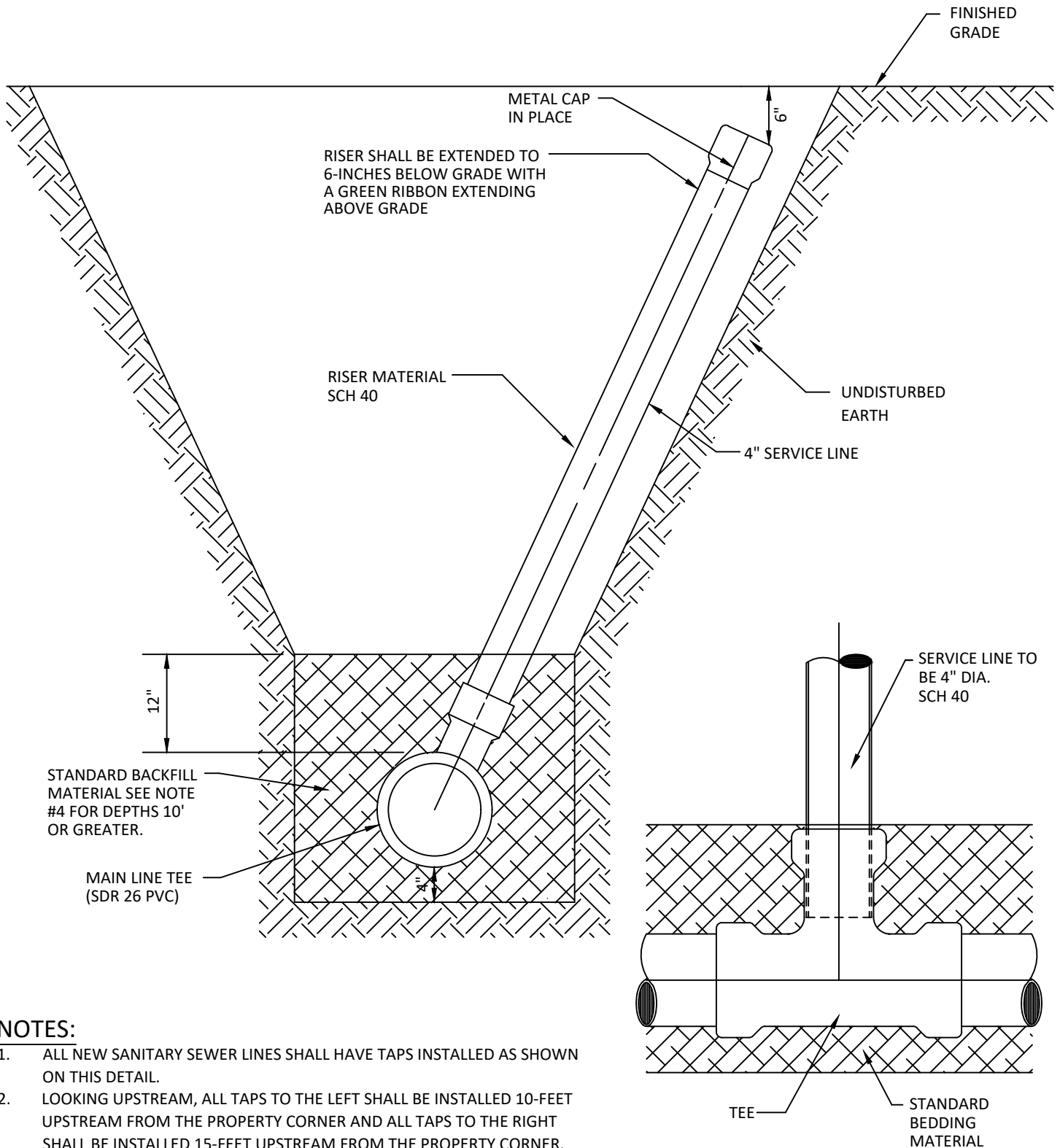
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NOTES:

1. ALL MAIN LINE HOLES TO BE CORE DRILLED AND COUPON PRESENTED AT TIME OF INSPECTION.
2. TAPS SHALL BE LEFT UNCOVERED UNTIL TAP IS INSPECTED BY LINE MAINTENANCE.
3. THE CONTRACTOR SHALL DRILL OR SAW A 4-INCH DIAMETER HOLE INTO THE EXISTING SEWER MAIN.
4. THERE SHALL BE A MINIMUM OF 2-INCHES FROM THE EDGE OF THE HOLE TO THE OUTSIDE EDGE OF THE TAPPING SADDLE.
5. ON AN EXISTING TAP THAT IS BEING REPAIRED, IF THE HOLE IS LARGER THAN 4-INCH DIAMETER OR THE PIPE IS IN POOR CONDITION, THEN THAT SECTION OF SANITARY SEWER PIPE SHALL BE REPLACED. SAID PIPE SHALL BE REPLACED WITH SDR 35 PVC TO A POINT UNTIL SOUND PIPE IS FOUND. THE MINIMUM LENGTH OF PIPE TO BE REPLACED IS 4-FEET. CITY WILL PROVIDE PLUMBER WITH COUPLINGS OR ADAPTERS AND PIPE TO REPLACE BROKEN SEWER LINE. WORK WILL BE INSPECTED BY LINE MAINTENANCE BEFORE BEDDING IS INSTALLED OVER PIPE.
6. FOR CLAY PIPE ONLY, A FLEXIBLE SADDLE MAY BE USED. THE SADDLE SHALL BE A DFW/HPI FLEXIBLE SADDLE AS MANUFACTURED BY "DFW QUALITY PRODUCTS BY NDS" OR EQUAL. WHEN INSTALLING A FLEXIBLE SADDLE, THE ABOVE REQUIREMENTS STILL APPLY.
7. FOR VERTICAL SERVICE, AN ADDITIONAL BEND WILL BE REQUIRED. THE USE OF 90 DEGREE BENDS IS NOT ALLOWED.

CITY ENGINEER APPROVAL:			CITY OF NORMAN, OKLAHOMA	
APPROVAL DATE:	REVISION DATE: 01/2023	REV. NO. 04	DRAWING NO. SS 07A	401

**NOTES:**

1. ALL NEW SANITARY SEWER LINES SHALL HAVE TAPS INSTALLED AS SHOWN ON THIS DETAIL.
2. LOOKING UPSTREAM, ALL TAPS TO THE LEFT SHALL BE INSTALLED 10-FEET UPSTREAM FROM THE PROPERTY CORNER AND ALL TAPS TO THE RIGHT SHALL BE INSTALLED 15-FEET UPSTREAM FROM THE PROPERTY CORNER.
3. FOR NARROW TRENCHES USE 4-INCH SDR 35 PVC RATHER THAN SCH 40.
4. DEPTHS OF 10-FEET OR GREATER THE BEDDING AROUND TEE SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

SANITARY SEWER TEE AND RISER

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CITY OF NORMAN, OKLAHOMA

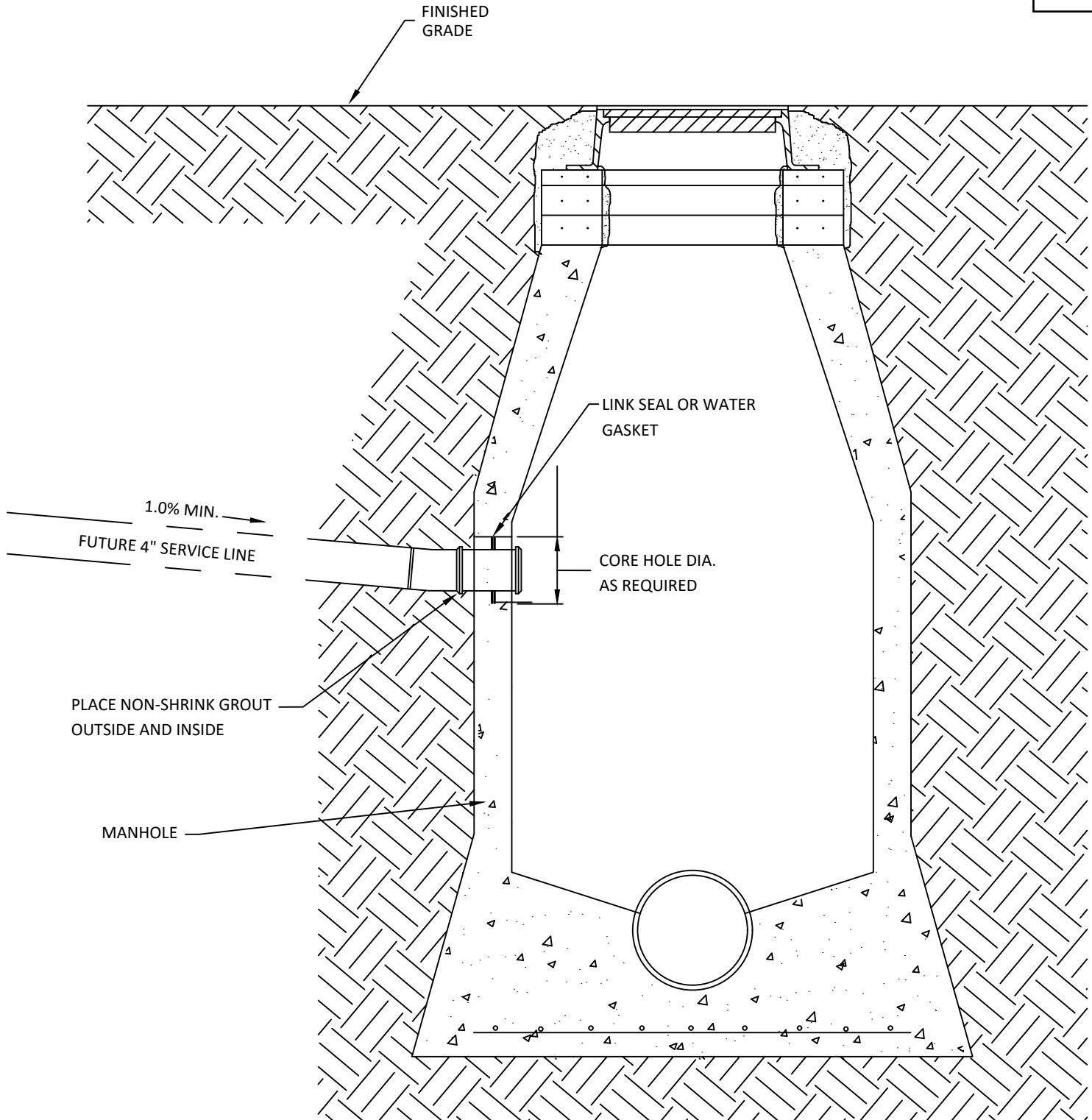
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 05

DRAWING NO. SS 08

402

**NOTE:**

1. LINE MAINTENANCE WILL INSPECT CORE HOLE AND LINK SEAL OR WATER STOP.
2. ODEQ HAS GRANTED NUA A VARIANCE FROM ITS REQUIRED DROP MANHOLE-(NONE REQUIRED)

SANITARY SEWER TAP AT MANHOLE

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CITY OF NORMAN, OKLAHOMA

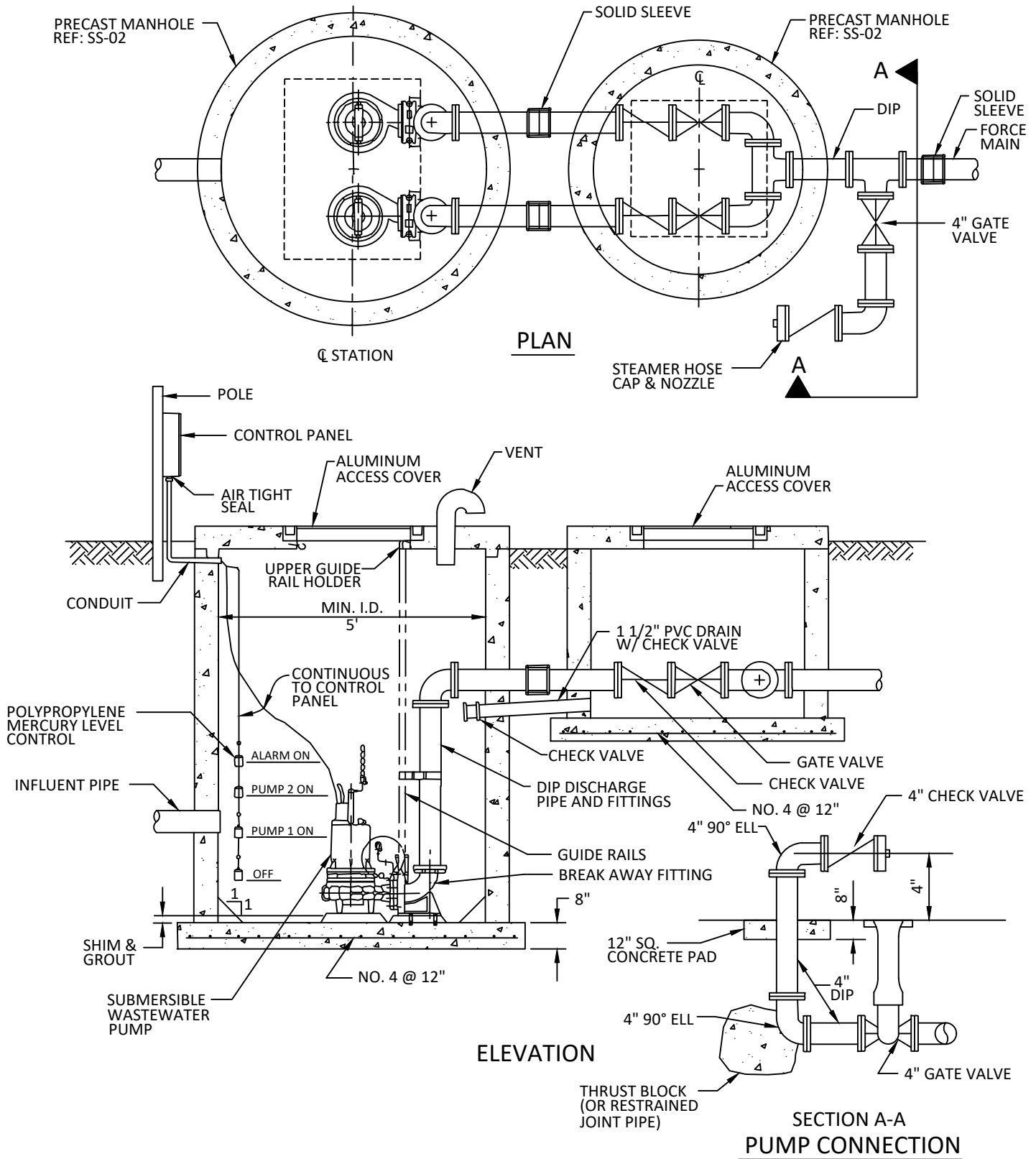
APPROVAL DATE:

REVISION DATE: 01/2023

REV. NO. 02

DRAWING NO. SS 10

403



SUBMERSIBLE LIFT STATION

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CITY OF NORMAN, OKLAHOMA

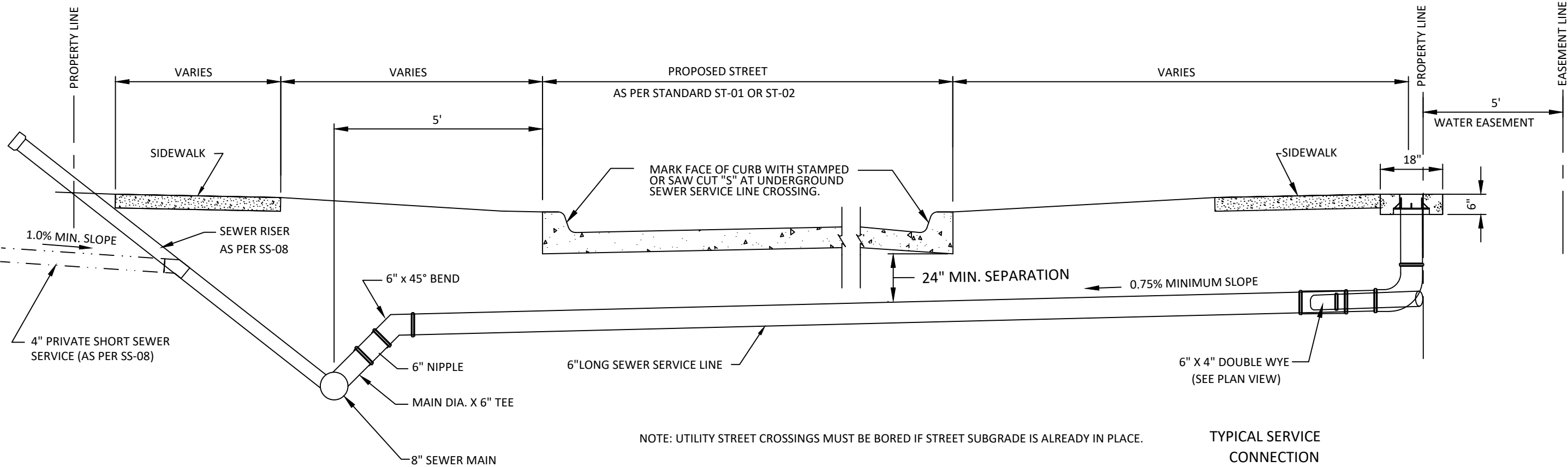
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REVISION DATE: 01/2023

REV. NO. 01

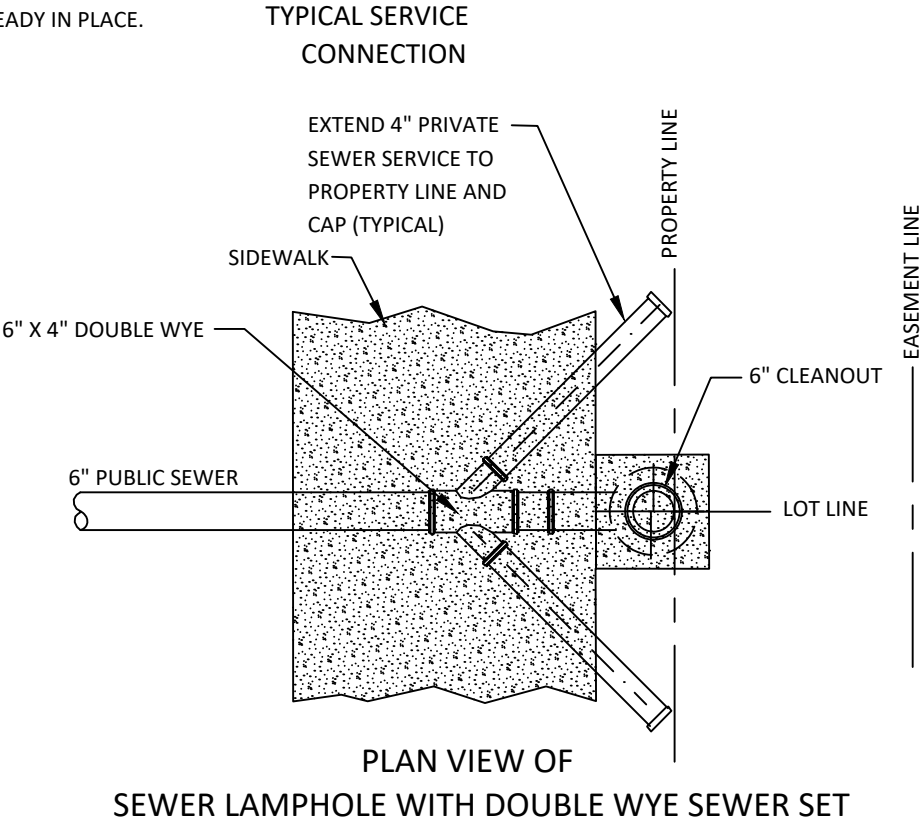
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405



LOCAL OR COLLECTOR STREET
6" SEWER SERVICE LINE INSTALLATION

- NOTES :
- 1. THIS STANDARD INDICATES THE DESIRED GEOMETRIC CONFIGURATION REFERENCED TO STREET PAVING AND PROPERTY LINES.
 - 2. ALL SEWER SERVICE LINES AND FITTINGS INSTALLED WITHIN THE STREET RIGHT-OF-WAY (ROW) SHALL BE SDR 26 PVC PIPE OR BETTER.
 - 3. LONG SEWER SERVICES FOR TWO ADJACENT LOTS SHALL BE PROVIDED IN ONE TRENCH. THE DEVELOPER/CONTRACTOR HAS THE OPTION OF INSTALLING A SINGLE 6-INCH DIAMETER PUBLIC SERVICE LINE WITH DOUBLE WYE AND TERMINATION MANHOLE AS DETAILED HEREIN OR TWO 4-INCH PRIVATE SERVICE LINES WITH INDIVIDUAL RISERS AT THE PROPERTY LINE.
 - 4. THE MINIMUM VERTICAL SEPARATION BETWEEN THE STREET BASE AND THE TOP OF THE LONG SEWER SERVICE PIPE IS 24-INCHES.
 - 5. THE MINIMUM VERTICAL GRADE DIFFERENCE FOR A 6-INCH PUBLIC SEWER SERVICE LINE IS 24-INCHES AS MEASURED BY SUBTRACTING THE FLOW LINE OF THE MAIN SEWER FROM THE FLOW LINE OF THE TERMINATION MANHOLE.
 - 6. MINIMUM DOWNWARD SLOPE OF A SEWER SERVICE LINE CROSSING THE STREET ROW IS 1.00% FOR 4-INCH PIPE AND 0.75% FOR 6-INCH PIPE.
 - 7. BACKFILL FOR SEWER SERVICES BENEATH AND 2-FEET EITHER SIDE OF THE ROADWAY SHALL BE SBM AS PER SS-01.
 - 8. SHORT SERVICE LINES SHALL BE CONSTRUCTED AS PER SS 08 EXCEPT THAT THE SERVICE LINE SHALL BE EXTENDED SO THAT A VERTICAL RISER TERMINATES JUST BEYOND THE PROPERTY LINE.
 - 9. ALTERNATE CONFIGURATIONS MAY BE INSTALLED IN LIEU OF THAT SHOWN UPON APPROVAL OF THE UTILITIES ENGINEER.



ENGINEERING DIVISION, CITY OF NORMAN		
6" SEWER SERVICE CONNECTION INSTALLATION		
APPROVED BY: _____ CITY ENGINEER	DATE: 01/2023	DRAWING NO: SS 14



Engineering Design Criteria

February 2, 2023

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LIST OF APPENDICES

APPENDIX A Traffic Study Guidelines

APPENDIX B Complete Streets Manual

APPENDIX C Water Quality Protection Zone (WQPZ) Ordinance

APPENDIX D Fee Schedule

Record of Revisions

The following are the effective date(s) of the City of Norman Engineering Design Criteria and all approved amendments:

Amendment	Description	Effective Date

Introduction

The Engineering Design Criteria, together with the City of Norman's Standard Specifications and Construction Drawings, regulate both public improvements and private work, which will either be dedicated to or accepted by the City. In addition, all work within the public right-of-way is governed by these regulations. They are intended to provide for coordinated development with adequate facilities to serve and protect the users.

These documents are meant to provide minimum criteria and to apply rigidly to new developments which are not constrained by already existing improvements. Designers are encouraged to exceed these criteria whenever possible to provide designs that enhance the community in the future. Infill development in an urban area is often constrained when matching existing improvements. To the extent deemed possible by the City Engineer, infill developments shall be completed in accordance with these Engineering Design Criteria. However, the City Engineer may allow modification of these requirements when necessary to allow private and public construction that is compatible with surrounding in-place improvements.

These design criteria, standard specifications, and construction standards shall also be used in conjunction with the City's zoning regulations and subdivision ordinances for site development work on private property.

Definitions

Agricultural Stormwater Runoff shall mean any stormwater runoff from orchards, cultivated crops, pastures, range lands, and other non-point source agricultural activities, but not discharges from concentrated animal feeding operations as defined in 40 CFR Section 122.23 or discharges from concentrated aquatic animal production facilities as defined in 40 CFR Section 122.24 and any addition or amendment thereto.

Best Management Practice (BMP) shall mean the best available practices or devices used singly or in combination to eliminate or reduce pollution entering the MS4.

Bridge shall mean a construction with abutments and superstructures, which are typically concrete, steel, or other materials. Since the superstructures are generally not an integral structural part of the abutments, and are therefore free to move, the hydraulic criteria for bridges is different than for culverts. Bridges shall also include multi-barrel culvert structures with a span length of greater than 20 feet meeting national standards. Bridges are also usually constructed with earth or rock inverts, whereas culverts are typically the same material throughout the waterway opening.

Collector Sewer shall mean sewer pipelines with a nominal diameter of 12-inches or less and may have sewer service taps.

Commercial shall mean property devoted in whole or in part to commerce, that is, the exchange and buying and selling of commodities or services. The term shall include, by way of example but not of limitation, the following business: amusement establishments, animal clinics or hospitals, automobile service stations, new or used automobile dealerships, automobile car washes, automobile and vehicular repair shops, banking establishments, beauty and barber shops, bowling alleys, bus terminals and repair shops, camera shops, dental offices or clinics, day care centers, department stores, drug stores, funeral homes, furniture stores, gift shops, grocery stores, hardware stores, hotels, jewelry stores, laboratories, laundries and dry cleaning establishments, liquor stores, medical offices and clinics, motels, movie theaters, offices buildings, paint stores or shops, parking lots, produce markets, or professional offices, radio stations, repair establishments, retail stores, restaurants and similar establishments serving prepared food and beverages, rooming houses, shopping centers, stationary stores, television stations and production facilities, and theaters.

Confidential Information shall mean a document or information regarding or describing a process, product or information which has been determined by the City to be confidential or has been declared by a court of competent jurisdiction to be exempt from disclosure to third parties under the Oklahoma Open Records Act and any amendment or supplement thereto.

Construction Activity shall mean, but not be limited, to clearing, grading, excavation, paving, building, and other ground disturbance activities associated with the construction of public assets. Construction does not include routine maintenance performed by public agencies, or their agents to maintain original line grade, hydraulic capacity, or original purpose of facility.

Culvert shall mean a closed conduit for the passage of water under an embankment, such as a road, railroad, or driveway. Culverts are most commonly used to relieve roadside drainage ditches and to convey stormwater beneath roadways at natural stream and creek crossings.

Detention Pond shall mean the flood-control features that temporarily hold water before gradually releasing flow to a river or stream, often referred to as “Dry Ponds”. Most of the year, these structures do not contain water and only collect water during and immediately following a precipitation event. The temporary storage provided by these structures reduce peak runoff rates experienced during a precipitation event.

Discharge shall mean to cause or allow to release, spill, drain, dump, throw, empty, emit, blow or pour of any pollutants into the MS4.

Earth Change is defined as excavation, grading, regrading, landfilling, berming or diking of land.

Erosion and Sediment Control Plan shall mean a written plan, including drawings or other graphic representations, for the control of soil erosion and sedimentation resulting from a land disturbing activity.

Flood Fringe shall mean the area between the floodway boundary and limit of the 100-year floodplain. The Flood Fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation of a 100-year flood event more than 1-foot at any point.

Floodplain Area shall mean the area defined by the 1% chance of a regulatory flood event.

Floodway shall mean the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Full Urbanization shall mean the total anticipated development within the project boundaries.

Hazardous Substance shall mean any substance listed in Table 3002.4 of 40 CFR Part 302 and any amendment or addition thereto.

Hazardous Waste shall mean any substance identified or listed as a hazardous waste by the EPA pursuant to 40 CFR Part 261.

Illicit Discharge shall mean any discharge to the MS4 not composed entirely of stormwater, except discharges authorized under an OPDES or NPDES permit (other than the OPDES permit for discharges from the MS4) and discharges resulting from firefighting activities.

Illicit Connection shall mean any drain or conveyance, either surface or subsurface which allows an illicit discharge to enter the MS4.

Industrial shall mean a business engaged in manufacturing or productive enterprise or a related service business. This term shall include, by way of example but not of limitation, the following: salvage yards, wrecker services, apparel and fabric finishers, blast furnace, boiler works, cold storage plants, contractors plants and storage facilities, foundries, furniture and household good manufacturing, forge plants, greenhouses, junk yards, manufacturing plants, metal fabricating shops, ore reduction facilities, planning mills, rock crushers, rolling mills, saw

mills, smelting operations, stockyards, stone mills or quarries, textile production, utility transmission or storage facilities, warehousing, and wholesaling facilities.

Industrial Activity shall mean any activity which is directly related to manufacturing, processing, or raw materials storage areas at an industrial facility. The term includes, but is not limited to, industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the industrial facility; sites where material handling activities are performed; refuse sites; sites used for the applications or disposal of process wastewaters; sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and immediate and finished products.

Industrial Facility or Industry shall mean a premise(s) whose function is classified in the latest edition of Standard Industrial Classification Manual, (United States Office of Management and Budget).

Industrial Stormwater Discharge Permit shall mean a permit regulating regular discharges from facilities who may control any conveyance which is used for collecting and conveying stormwater and which is directly related to material storage, fueling, handling, and processing areas at an industrial plant.

Industrial Waste shall mean any airborne particulates, waterborne liquid or solid substance that results from any process of industrial, manufacturing, mining, production, trade, or business activities, including concrete washout.

Institutional shall mean an established organization, especially of a charitable or public character. This term shall include, by way of example but not of limitation, the following: churches, community buildings, colleges, day care facilities, dormitories, drug or alcohol rehabilitation facilities, fire halls, fraternal organizations, golf courses and driving ranges, government buildings, hospitals, libraries, kindergartens or preschools, nursing homes, mortuaries, schools, social agencies, synagogues, parks, and playgrounds.

Interceptor Sewers shall mean sewer pipelines with a nominal diameter of greater than 12-inch and may not have sewer services taps.

Manufactured Systems shall mean commercial products that typically aim at providing stormwater treatment in space-limited applications.

Material Handling Activities shall mean the storage, loading and unloading, transportation or conveyance of any raw material, immediate product, finished product, by-product or waste product.

Monitoring shall mean the performance of stormwater flow measurements, stormwater sampling, sample analysis, and like procedures necessary to determine compliance with stormwater discharge activity.

Motor Vehicle Fluid shall mean any vehicle crankcase oil, antifreeze, transmission fluid, brake fluid, differential lubricant, gasoline, diesel fuel, gasoline/alcohol blend, and any other fluid used in, or from within, a motor vehicle.

Multi-family Residential shall mean an apartment building or other residential structure built for three or more family units, mobile home parks with three or more units or lots under common ownership, and condominiums of three or more units.

Municipal Separate Storm Sewer System (MS4) shall mean a conveyance or system of conveyances (including streets, curbs, gutters, storm drains, catch basins, natural and man-made channels and ditches) owned by the City of Norman and designed for collecting and conveying stormwater.

National Pollutant Discharge Elimination System (NPDES) Permit shall mean a permit issued by EPA (or by the State under authority delegated pursuant to 33 U.S.C. § 1342 (b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Non-point Source shall mean any source of any discharge of a pollutant that is not a "point source."

"Notice of Intent" (NOI) shall mean a written notice by a discharger or potential discharger to the Director, or his designee, that the person wishes his discharge to be authorized under a general permit authorized by State law or regulation.

"Notice of Termination" (NOT) shall mean a written notice by a discharger to the Director of the Department of Public Works, or his designee, that the project permitted has 70 percent re-vegetation of all bare areas and all soil disturbing activities are concluded, allowing the termination of the permit issued under this section, or the discharger is no longer the operator of the facility and another has assumed the responsibility and filed a NOI.

Person shall mean any individual, partnership, co-partnership, firm, Company, corporation, association, joint stock company, trust, estate, governmental entity or any other legal entity or their legal representatives, agents or assigns.

Pipe depth or depth of cover shall mean the difference between the finished grade elevation and the top of the pipe.

Point Source shall mean any discernible, confined and discrete conveyance including, but not limited, to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged.

Pollutant shall mean any dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, wrecked or discharged equipment, rock, sand, cellar dirt, soil, sediment, building materials, industrial or agricultural waste.

Pollution shall mean the presence in or introduction into the environment of a substance or thing that has harmful or poisonous effects.

Pollution Prevention Plan shall mean a written site-specific plan to eliminate or reduce and control the pollution of stormwater through designed facilities, sedimentation ponds, natural or constructed wetlands, and Best Management Practices.

Premises shall mean any plot or tract of property, regardless of size or plat, owned or used by any person.

Release shall mean any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the Municipal Separate Storm Sewer System (MS4), Waters of the State, or the Waters of the United States.

Retention Pond shall mean the flood-control features that maintain a volume of water year-round. Retention ponds are often referred to as “Wet Ponds”. The amount of water within these ponds fluctuates based on the amount of precipitation and runoff that an area experiences.

SIC Code shall mean Standard Industrial Classification Code of Executive Office of the President of the United States, Office of Management and Budget.

Significant Spills shall mean the inclusion of but not limited to releases of oil or hazardous substances in excess of reportable quantities under section 311 of the Clean Water Act (see 40 CFR 110.10 and CFR 117.21) or section 102 of CERCLA (see 40 CFR 302.4) and any amendment or addition thereto.

Solid Waste shall mean any garbage, rubbish, refuse, municipal solid waste, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, municipal, commercial, mining, agricultural operations, community and institutional activities, including metal shavings, plastic pellets, paint chips, carpet fibers, wood chips, sawdust, grass clippings and leaves.

Spills shall mean any release that, in the opinion of the Director of Public Works or their Designee, negatively impacts the quality of water within or discharges from the City's municipal separate storm sewer system or causes damaging or deleterious effects to the City's municipal separate storm sewer system including all structures or appurtenances, and/or the waters to the storm sewers.

State shall mean the State of Oklahoma.

Stormwater shall mean any flow occurring during or following any form of natural precipitation and resulting therefrom.

Stormwater Control Measures shall mean stormwater runoff treatment systems. SCMs are also commonly known as best management practices (BMPs). These are engineered facilities designed to reduce and/or treat stormwater runoff, which mitigate the effects of increased stormwater runoff peak rate, volume, and velocity due to urbanization.

Stormwater discharge associated with industrial activity shall mean stormwater from areas of industrial activity or areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater.

Stormwater Management shall mean the collection, conveyance, storage, treatment and disposal of stormwater runoff in a manner to meet the objectives of this article and its terms, including, but not limited to measures that control the increased volume and rate of stormwater runoff and water quality impacts caused by man-made changes to the land.

Stormwater Management Program or SMP shall mean the set of drawings and other documents that comprise all of the information and specifications for the programs, drainage systems, structures, SCMs, concepts, and techniques for the control of stormwater and which is incorporated as part of the NPDES permit for the City, and as part of this article.

Streets shall mean earthwork, subgrade, base course(s), wearing surface, concrete curb and gutters, proper backfill, and proper drainage structures, including storm sewers, stormwater control measures (SCMs) and inlets that work as a system to support the design traffic loading over the prescribed design life.

Toxic Pollutant shall mean any pollutant or combination of pollutants listed as toxic in 40 CFR Part 401 promulgated by the Administrator of the Environmental Protection Agency under the provisions of 33 U.S.C. § 1317 and any amendment or addition thereto.

Uncontaminated shall mean not containing a harmful quantity of any substance.

User shall mean any source of direct or indirect discharge to the City of Norman Municipal Separate Storm Sewer.

Water of the State (or water) shall mean any groundwater, percolating or otherwise, lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, inside the territorial limits of the State, and all other bodies of surface water, natural or artificial, navigable or non-navigable, and including the beds and banks of all water courses and bodies of surface water, that are wholly or partially inside or bordering the State or inside the jurisdiction of the State.

Waters of the United States shall mean all waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce including all waters which are subject to the ebb and flow of the tide; all interstate waters, including interstate wetlands; all other waters the use, degradation, or destruction of which would affect interstate or foreign commerce; all impoundments of waters otherwise defined as Waters of the United States under this definition; all tributaries of waters identified in this definition; all wetlands adjacent to waters identified in this definition; and any waters within the Federal definition of "Waters of the United States" at 40 CFR § 122.2; but not including any waste treatment systems, treatment ponds, or lagoons designed to meet the requirements of the Federal Clean Water Act.

Water Quality Protection Zone (WQPZ) shall mean a vegetated strip of land in the Lake Thunderbird watershed and its adjacent wetlands, floodplains, or slopes that is comprised of the stream bed and areas adjacent to the stream bed and the distance of which is determined by the Water Quality Protection Zone Design Standards found in Section 19-411(B), (C), and (D) of the Code of the City of Norman.

Water Quality Volume (WQV) shall mean the minimum volume of stormwater runoff from the contributing drainage area to the control for treatment

Design Criteria

1000: GENERAL

1001 STANDARDS AND SPECIFICATIONS

- 1001.1 All plans are reviewed to determine the future effect on the proposed site and adjacent area development. During the plan review, the impact on City and City-operated facilities will be considered.
- 1001.2 All criteria within the specifications shall be met unless the Engineer of Record submits the proposed changes and justification to the City Engineer for approval.
- 1001.3 Any work not covered by the adopted engineering design criteria or standard specifications shall be submitted for approval. The Engineer of Record shall submit the design, specifications, and/or special provision with his first submittal for review and acceptance by the City Engineer.
- 1001.4 Review and acceptance of plans by the City does not release the Consulting Engineer, Architect, or Contractor from his professional responsibility as stated within the by-laws of the Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors
- 1001.5 The Contractor must keep a set of approved construction plans on the job site at all times.
- 1001.6 All construction plans and reports shall be signed, sealed and dated by a Professional Engineer registered in the State of Oklahoma prior to plan submittal.
- 1001.7 All pay items shall be increased to the next full unit, and the method of measurement listed in the proposal as the basis for payment.

1002 DRAFTING AND GIS

- 1002.1 Submittals to the City shall be completed in an electronic and paper format. The electronic format shall include pdf files and CAD files in a format compatible with the City's GIS system. The paper format shall be submitted per the requirements defined in the subdivision regulations.
- 1002.2 Standard sheets shall be 24" x 36", having a margin of 1.5" along the left border and 0.5" along the top, bottom, and right borders.
- 1002.3 All project drawing packages shall have a cover sheet containing the project title, project location with location map, project owner's name, address,

telephone number, and contact person, if not the owner, Engineer of Record name, address, and telephone number, drawing index and legend.

- 1002.4 The cover sheet shall not be used for a plan sheet. The package must also include an overall plan sheet showing proposed improvements with sufficient labeling for reference to plan and/or profile sheets.
- 1002.5 The cover sheet shall be sealed. The CA number and the expiration dates must be shown on the cover sheet.
- 1002.6 North shall be oriented to the top or right-hand side of all plan sheets. The north arrow shall not be pointed down.
- 1002.7 A Title Block shall be located in the lower right-hand corner or right side of each sheet and shall include the project title, Owner's and Engineer's name, drawing description, page number, project number (if required), and date.
- 1002.8 The scale shall not be less than 1": 50' horizontal and 1": 5' vertical on plan and profile sheets. The minimum scale shall be 1" = 100' on plan sheets. Larger scales may be required where conditions warrant. Plans must include a scale bar so they may be scaled if not reproduced at the exact size as the original.
- 1002.9 All line work and text shall be of sufficient density to be reproducible by current reproduction processes. Any line work which does not reproduce satisfactorily may be cause for rejection of the plans by the City.
- 1002.10 Proposed improvements shall be shown darker to be distinguished from existing improvements.
- 1002.11 All lettering shall be at least 0.12" high and 0.10" width per letter except mechanical lettering on plats or records reproduced in the plans may be 0.10" high and 0.10" width. All lettering must be legible at half size.
- 1002.12 All base maps shall be referenced to existing land lines (section corners, etc.). Property lines, right-of-way, easements, building lines, etc. shall be located and dimensioned.
- 1002.13 No public improvements shall be installed without the dedication of right-of-way or appropriate easements. These easements shall be submitted for review and acceptance prior to filing. Easements will be filed by the City.
- 1002.14 All structures (manholes, junction boxes, etc.) shall be numbered and labeled both in plan and in profile and detailed on plans.
- 1002.15 Waterlines, sanitary sewer mains, and storm sewer lines shall be identified on both plan and profile sheets.
- 1002.16 Drawings shall show all obstructions existing and proposed, above and below ground. These shall be located vertically and horizontally. The Engineer of

Record shall be responsible for contacting ALL utilities to obtain locations of their facilities. This also applies to various affected pipeline companies. The City is not responsible for the location and depth of buried obstructions. "Potholing" or excavation should be performed to verify depth or location of obstructions at no expense to the City.

1002.17 Drawings shall show existing and proposed elevations of the proposed site improvements and alterations after construction.

1002.18 A list of construction pay items and an estimate of quantities shall be shown on the plans.

1002.19 Upon completion of construction, the Engineer of Record will furnish the City Engineer's office as-built drawings incorporating changes made during the construction process. The Contractor is responsible for maintaining an as-built drawing on-site at all times to be verified by the Engineer of Record and city personnel. The as-built drawings are to be certified and sealed by a Professional Engineer. The as-built drawings shall include the following:

- A. Retaining Walls, and other physical site improvements (cross-sections may be necessary to detail these features).
- B. Driveway grades.
- C. Existing grade elevations at: the rear lot corners, the top of curb at the front lot line extension, the center of the lot at the building line or set-back line.
- D. All drainage features within the lots shall be surveyed.
- E. Lot drainage arrows.
- F. Existing pad and proposed finished floor elevations. Grade breaks and slopes 3:1 or greater.

1002.20 Deviations from the approved Site Grading Plan must be reviewed and accepted by the City Engineer or designee to:

- A. Revise pad elevation.
- B. Revise finished floor elevation.
- C. Change drainage flow direction.
- D. Revise other significant proposed features.

1002.21 The Engineer of Record will submit as-built drawings in electronic format to the City. The format will be in PDF and CAD files compatible with the city GIS requirements.

1003 BENCHMARKS

- 1003.1 All development must be tied to two City of Norman control points. The City of Norman control point locations and information can be found at:
<https://www.arcgis.com/apps/webappviewer/index.html?id=700e9d6a402f4772aa750d6d72e928b4>
- 1003.2 All elevations shown on the plans shall be based on NAVD 88 level datum.
- 1003.3 Horizontal coordinates shall be on the basis of the NGS Oklahoma State Plane Coordinate System, South Zone (3502) NAD 83, latest revision.
- 1003.4 The permanent benchmark location and description used to extend level datum to the projects shall be noted on the plans.
- 1003.5 All temporary benchmarks used for control of the project shall be designated on the plans stating elevation, location, and description. The nearest such benchmark shall be shown on each sheet.
- 1003.6 A permanent benchmark shall be established on the project. This permanent benchmark will meet the Oklahoma State Board of Engineers and Land Surveyors' requirements for a permanent benchmark. The cap shall read "City of Norman Benchmark" together with a letter and/or numerical designation assigned it by the City Engineer's office from the master file of benchmarks maintained by the City Engineer's office. The location, description, and elevation of the permanent benchmarks shall be shown on the front sheet of the plans and final plats.
- 1003.7 Permanent benchmark data shall be provided in electronic format to be incorporated within the City's GIS system.

1004 INITIAL SITE GRADING PLAN

- 1004.1 Present site conditions:
 - A. Existing site topography extending a minimum of 50 feet past property limits with contour lines (1' maximum interval) shall be provided. In some cases 0.5' intervals may be necessary.
 - B. Existing features:
 - 1. Easements and rights-of-way.
 - 2. All utilities.
 - 3. Drainage ways with 1% chance floodplain and floodway limits.
 - 4. Buildings, fences, retaining walls, and other physical features .
 - 5. Spot elevations at perimeter lot lines.
 - 6. Storm drainage structures and off-site drainage.

7. All existing above ground features.

1004.2 Proposed site conditions:

- A. Drainage flow arrows.
- B. Proposed topography at a maximum of one (1) foot contour intervals.
- C. Proposed improvements:
 - 1. Sidewalks, bike paths, and other public improvements.
 - 2. Storm drainage structures and off-site drainage.
 - 3. Top of curb elevation at each 100-foot station.
 - 4. Retaining walls that are 3 feet high or higher.
 - 5. Pad and proposed finished floor elevations.
 - 6. All ADA site features.
 - 7. Any other significant improvements/site features that are not otherwise listed above.
- D. The stormwater runoff from no more than 3 lots or ½ acre (whichever is less) shall be allowed onto another lot or between 2 lots. If more lots or area needs to be drained, then an underground storm sewer shall be required.
- E. Maximum slopes.
 - 1. For utility easements 6:1.
 - 2. For lots in urban areas 3.5:1.
- F. All drainage areas shall be clearly marked on the drainage area plan sheet; showing acreage, runoff and off site pickup points.

1004.3 Erosion Control: A Sediment and Erosion Control Plan shall include plans for both pre- and post-construction. These plans shall be prepared and submitted for review and approval by the Stormwater Program Manager or City designee.

1005 EARTH CHANGE PERMIT

1005.1 A written permit shall be issued by the Stormwater Program Manager, City Engineer, or designee prior to any person, firm, or corporation initiating an earth change.

1005.2 The permit fee shall be submitted as part of the Earth Change Permit application. Please see **APPENDIX D Fee Schedule**.

1006 RURAL REQUIREMENTS

- 1006.1 Mailboxes: Mailboxes shall be located along the edge of the roadway, so that mail can be delivered to the box without leaving the paved surface. Mailbox supports shall be painted or reflectorized so as to be clearly visible in accordance with U.S. Postal Service regulations.

No brick, masonry or other structurally rigid mail boxes shall be allowed on rural roads with a speed limit greater than 40 mph. The type of mail box support that will be allowed is a light weight (18 gauge) 1½ inch diameter metal post, 4"x4" wooden post or approved equal. Posts may be set in concrete. Equivalent supports shall be approved by the City Engineer or City Transportation Engineer.

- 1006.2 Right-of-Way Maintenance: All owners of property abutting a street or road in those areas zoned A-1, A-2, and R-E, and which has been platted and subdivided in accordance with City of Norman Regulations and Ordinances, shall maintain the rights-of-way of said streets and roads.

1007 RETAINING WALL DESIGN

- 1007.1 All retaining walls 3 feet and more in height or those supporting 2 feet of soil or more, measured from the top of footing to top of wall, shall be required to obtain a retaining wall permit prior to construction. All retaining wall designs greater than 3 feet in height shall be prepared and sealed by a registered professional engineer. The height of a retaining wall is measured from the top of the wall to the top of the foundation (footing).

A. The permit application shall include:

1. A plan view drawing showing the location of the proposed retaining wall, all existing or proposed structures and all easements.
2. A cross-section drawing showing exactly how the retaining wall will be constructed (i.e., concrete, rebar, blocks, etc.).

- 1007.2 Retaining Wall Permit Fees shall be submitted with the retaining wall design. Fees shall follow **APPENDIX D Fee Schedule**..

- 1007.3 Penalties:

- A. If a retaining wall is constructed without a permit, fees will be doubled.
- B. If the Builder/Contractor obtained a retaining wall permit, but the retaining wall was constructed without contacting the City for inspections, the penalty established in **APPENDIX D Fee Schedule** shall be assessed for each missed inspection. The Builder/Contractor will be required to provide certification from the Design Engineer that the retaining wall was constructed per the permit.

1008 SOLID WASTE CONTAINER ENCLOSURE

- 1008.1 The location of a solid waste container enclosure shall be shown on the site plan and approved by the Utilities Engineer and City Engineer. The configuration and components of the enclosure shall be in accordance with the City standards.
- 1008.2 Access to the solid waste containers shall be made easy for sanitation vehicles. Backing into a street or parking way in order to egress the waste container is prohibited. Any backing requirement of greater than 50-feet shall be approved by the City.
- 1008.3 Solid waste container enclosure location shall be shown on the site plan and approved by the City.
- 1008.4 Access to a solid waste container enclosure must be by paved surface meeting City requirements. For private paving, the City will not be responsible for any damage as the result of solid waste service.
- 1008.5 For rural subdivisions, trash receptacles must be brought to the nearest through City street.
- 1008.6 All non-residential developments shall be required to utilize a dumpster unless polycart service is approved by the City due to the property's location and adjacent service area type.

1009 ENCROACHMENT OF PUBLIC PROPERTY

- 1009.1 Temporary encroachment permits
 - A. Temporary Encroachment Permits are required for the use of public property for construction or demolition. Construction or demolition by a City of Norman contractor, developer of a commercial or residential subdivision, or franchise Utility Company is exempt from paying a fee but is required to obtain a permit. When said developer encroaches onto public property longer than the initially agreed upon time, then he shall pay a penalty (see the schedule of fees).
 - B. Requirements for Temporary Encroachment Permits
 - 1. Liability of public property. The amount of liability insurance to be set by the City Engineer and/or Public Works Director.
 - 2. Pedestrian protection. The applicant must provide for pedestrian protection from construction and/or demolition by the use of railings, fences, walkways, and canopies as required by the City Engineer and/or Public Works Director.

3. Plans. The applicant must supply plans showing the location and amount of public property to be occupied: the location of all railings, fences, canopies and construction offices, sheds and other appurtenances: and the nature and location of all warning devices necessary to protect pedestrian and vehicular traffic. These plans must be approved by the City Engineer and/or Public Works Director.
4. Any pedestrian or traffic detours must be submitted to the Transportation Engineer for approval prior to commencing any work. All detour routes must be ADA compliant.
5. Permit Fee. Please see **APPENDIX D Fee Schedule**.
6. Inspections - An inspection must be obtained after all barricades, fences, railings and other forms of pedestrian and vehicular protection are in place. A final inspection must be obtained after all such items are removed.

1009.2 Consent to Encroach

- A. Private improvements may not be constructed over an existing utility easement without written City approval for the proposed encroachment. All costs of applying, obtaining, and filing a consent to encroach to be borne by the requesting entity.

END OF SECTION 1000

2000: WATER LINES

2001 GENERAL REQUIREMENTS

- 2001.1 The minimum design criteria for all public water facilities shall be the most current edition of Title 252: Oklahoma Administrative Code, Chapter 626, Public Water Supply Construction Standards, Oklahoma Department of Environmental Quality (ODEQ).
- 2001.2 The City of Norman is authorized to self-permit water lines 12-inch and less in diameter by ODEQ. The Design Engineer or Developer is responsible for acquiring ODEQ authorizations and permits for pump stations and pipe lines greater than 12-inch. The Developer shall be required to submit the required documentation for approval and the ODEQ required application, engineering report, and fee.
- 2001.3 A Maintenance Bond or Irrevocable Letter of Credit shall be posted in an amount based on a percent of the determined amount of construction costs for a period after the completion and acceptance of the project work, defined as follows:
- A. Privately Financed Projects: 50% for one (1) year period
 - B. Publicly Financed Projects: 100% for the first year plus 15% for the second year
- Should repairs on either privately or publicly financed projects be necessary during the maintenance bond period, the repairs made shall also be fully bonded for an additional one-year period from the date of completion and acceptance of the repair work by the City.
- 2001.4 In accordance with ODEQ regulations, the City provides water at a minimum pressure of 25 psi. The Developer is responsible for designing and constructing all fixtures and systems to provide adequate domestic and fire protection under minimum pressure conditions. The Developer shall be responsible for any failure of domestic and fire protection systems which require water in excess of 25 psi.

2002 WATER SERVICE REQUIREMENTS

- 2002.1 Water lines shall be separated from a sanitary sewer at least 10-feet horizontally and 2-feet vertically per ODEQ separation requirements.
- 2002.2 Water lines shall be installed along the entire frontage of the subdivision or development adjacent to a street or thoroughfare. If the subdivision is not adjacent to a thoroughfare, the extension of utilities shall be accomplished in such a manner as to allow future connections to said utilities by future developments, unless otherwise approved by the Utilities Engineer.

- 2002.3 Generally, water lines shall be on the south or east side of right-of-way. Water lines shall be at least 10 feet from any proposed or existing structure, measured from the edge of the outermost wall, unless otherwise approved by the Utilities Engineer. When properties are rezoned or when the building setback lines are changed, the Developer shall be responsible for relocating the water main if the existing water main will be less than 10-feet from a proposed structure. Water lines shall not be installed within an Oklahoma Department of Transportation (ODOT) right-of-way, except in permitted crossings or approved by the Utilities Engineer. Water lines not in street right-of-way shall be centered in a waterline easement with a minimum width of 15-feet, unless otherwise approved by the Utilities Engineer.
- 2002.4 The minimum size of water line on all section lines and arterial streets shall be 12-inch diameter and 8-inch diameter on half-section lines and all collector streets. The minimum size of all other lines shall be 6-inch diameter. Proposed water lines and service lines shall be sized to accommodate the domestic supply, fire flow, irrigation, industrial demands appropriate for the property(-ies) they serve. Water mains may be required to be upsized in compliance with the latest City of Norman Water System Hydraulic Model. The additional cost for the upsize shall be determined by the Utilities Engineer and may request the developer to participate in cost sharing of the additional construction costs.
- 2002.5 Water lines shall be designed to have a standard depth of cover of 3.5-feet and maximum depth of cover of 8-feet, unless approved by the Utilities Engineer. Final grading activities, either cut or fill, may warrant the replacement of the existing water line to maintain the required depth of cover.
- 2002.6 Existing and proposed centerline grade above water lines and proposed curb grade, or proposed centerline of street grade, shall be shown on profile.
- 2002.7 Isolation valves shall be installed on a minimum of each branch minus one of a tee or a cross fitting such that no more than one block is out of service at a time and a maximum four valve shutout. For instance, on a cross, valves shall be required on at least three branches from the cross. Spacing between valves shall not exceed 1,320-feet or in accordance with ODEQ regulations. Additional valves will be required at stream, ODOT right-of-way, and railroad crossings. Type of isolation valve used on water lines shall be as follows:
- A. Gate Valve for diameters 12-inch or smaller.
 - B. Butterfly valve for diameters larger than 12-inch.
- 2002.8 Dead ends shall be avoided whenever practicable. Where a dead end is necessary, a fire hydrant must be installed at the end of the water line. The hydrant shall be located such that the flushed water is discharged on the ground and not directly connected to any sanitary or storm sewer. The Utilities Engineer may require the installation of an automatic flushing device in lieu of a fire hydrant in areas that may be difficult to access or as deemed necessary. If

a dead end is planned to be temporary and will be looped in the near future, a flushing device (auto-flusher or blow-off hydrant) may be installed with approval of the Utilities Engineer.

2002.9 Water lines installed under existing or proposed driving surfaces shall have aggregate backfill material which conforms to ODOT 703.01, Type A Aggregate Base or flowable fill which conforms to ODOT 501.02.

2002.10 Fire Hydrants:

- A. All fire hydrants shall be located in street right-of-way or easement. In a platted subdivision all fire hydrants shall be located at the lot line, or lot line extension, and at the elevation shown on the plans based on the finished grade.
- B. Except as herein provided, a fire hydrant shall be located between 3-feet and 6-feet from the back of curb (or edge of pavement) to the centerline of the barrel unless otherwise approved by the Utilities Engineer.
- C. Fire hydrants may be located more than 6-feet from the back of curb (or edge of pavement) only if all of the following conditions are met:
 - 1. In no case shall the fire hydrant be located greater than 15 ft. from the back of curb (or edge of pavement).
 - 2. A blue reflective indicator shall be placed in the center of the street at the fire hydrant.
- D. Fire hydrants in residential, unsprinklered commercial, and industrial areas shall be placed at each street intersection, water line termination in cul-de-sacs, and other locations so that the distance between them does not exceed 300 feet. This distance shall be measured in the street as fire hose laid down from a fire vehicle. Fire hydrants shall be located such that all proposed or existing structures are within 300-feet and in direct line from another fire hydrant. Hydrant placement near sprinkled structures must be approved by the City of Norman Fire Chief.
- E. All fire hydrants located outside of the right-of-way to provide fire suppression for a commercial or industrial structure shall be fully accessible from paved driveways, streets, parking lots, and fire lanes.
- F. The fire hydrants connection to the water line shall be in accordance with the City's "Standard Specifications and Details".
- G. All fire hydrant assemblies shall include gate valves on the branch pipe to isolate the fire hydrant from the water main. Pipes branching from the water

main serving fire hydrants shall not be a plastic pipe material, unless approved by the Utilities Engineer.

- H. A tamper resistant operating mechanism shall be installed on all fire hydrants install east of 48th Avenue NE or as directed by the Utilities Engineer.

2002.11 All water pipes shall conform to the current American Water Works Association (AWWA) specifications. The allowable materials include:

Material	Specifications ¹	Application
Polyvinyl Chloride (PVC)	AWWA C900, DR-018 (231 psi) minimum	All Water Mains
High Density Polyethylene (HDPE)	AWWA C906, DR-11 (200 psi) minimum, DIPS sizing	Trenchless Installation only
Ductile Iron Pipe (DIP)	AWWA C151, Pressure Class 200 minimum	Only where potential for contact with hydrocarbons exist ²

¹ Pressure class or DR rating to conform with expected hydraulic conditions of pipe.

² Or as approved by Utilities Engineer.

- A. The following nominal pipe diameters are acceptable: 6, 8, 12, 16, 20, or 24 inches. For service lines only, 4-inch nominal diameter pipe will also be acceptable. Diameters larger than 24-inch to be approved by the Utilities Engineer.
- B. For HDPE piping, pipe shall only be used for trenchless directional drilling applications where no service connections are proposed. Additionally, HDPE wall thickness shall be considered when selecting the appropriate pipe size for hydraulic conditions.
- C. For DIP piping and fittings, the exterior of the pipe shall have a layer of arc-sprayed zinc under the bituminous coating or asphaltic top coating. All buried ductile iron pipe and fittings shall have a tube type polyethylene encasement treated with V-Bio in accordance with manufacturers recommendations.

2002.12 PVC pipe installed by open cut shall have one #12 copper tracer wire with HDPE coating attached to the top of it. Wire shall connect to a weatherhead or fire hydrant per the current City Standard Specifications and Details. For trenchless installations, the tracer wire shall be #8 Copper Head Solo Shot Extra-High Strength Tracer Wire or approved equal.

- 2002.13 Cover over water lines at creek crossings shall be 4-feet minimum. Water lines shall be restrained joint pipe through the creek area. The restraint length shall begin and end at least 10-feet horizontally from the top of the creek bank or the next pipe joint, whichever is greater.
- 2002.14 Where a rural roadway section is allowed, a separate easement, a minimum of 15-feet wide, shall be granted adjacent to the street right-of-way, in which the proposed water line shall be placed.
- 2002.15 For private fire lines, the backflow prevention device shall be installed in a concrete vault and shall be constructed in accordance with the current Standard Specifications and Construction Drawings. During installation, the fire line shall be pressure tested and chlorinated by the Contractor under the observation of the City of Norman staff. Public service taps will not be allowed on the public line between the main distribution line and the isolation (gate) valve or the backflow prevention device.
- 2002.16 Fire department connections (FDC) shall be installed per City of Norman's Fire Code.

END OF SECTION 2000

3000: SANITARY SEWER

3001 GENERAL REQUIREMENTS

- 3001.1 Minimum design criteria for all Sanitary Sewer Collection and Treatment Facilities shall be the Title 252. Oklahoma Administrative Code, Chapter 656. Water Pollution Control Construction Standards, most current edition, Oklahoma Department of Environmental Quality (ODEQ).
- 3001.2 The Developer shall be required to submit the required documentation for approval and the ODEQ required application, engineering report, and fee.
- 3001.3 A Maintenance Bond or Irrevocable Letter of Credit shall be posted in an amount based on a percent of the determined amount of construction costs for a period after the completion and acceptance of the project work, defined as follows:
 - A. Privately Financed Projects: 50% for one (1) year period
 - B. Publicly Financed Projects: 100% for the first year plus 15% for the second year

Should repairs on either privately or publicly financed projects be necessary during the maintenance bond period, the repairs made shall also be fully bonded for an additional one-year period from the date of completion and acceptance of the repair work by the City.

3002 SEWER LINES

- 3002.1 Sanitary sewers shall be installed and separated from an existing or proposed water line at least 10-feet horizontally and 2-feet vertically, per ODEQ separation requirements.
- 3002.2 New sewer laterals shall be installed in the front of the lot to the sewer collection main in the right-of-way or easement, unless approved by the Utilities Engineer.
- 3002.3 Side lot easement widths will be based upon other utilities in the easement and the location and depth of the sewer with a minimum width of 15-feet.
- 3002.4 No public gravity sewer shall be less than 8-inches in diameter. Sewer pipe shall be PVC (SDR 35 or better) in only the following sizes: 8, 12, 15, 18, 24, 30, 36, or 42-inches. Pipe in larger sizes, or constructed of different materials, shall be approved by the Utilities Engineer.
- 3002.5 For dead-end sewers, the sewer line shall be extended across the last lot and terminate with a manhole within the street ROW. Greater distances may be approved to locate manholes adjacent to streets.

- 3002.6 Alignment, size, and grade of sewer lines and private laterals shall be designed by the Developer or Design Engineer and are subject to review by the Utilities Engineer. The minimum design grade for sanitary sewer is shown in the following table:

Minimum Pipe Grade	
Pipe Diameter	Design Grade
6 in	0.750%
8 in	0.500%
12 in	0.290%
15 in	0.220%
18 in	0.170%
21 in	0.140%
24 in	0.120%

- 3002.7 All sewer pipes shall conform to the City's current Standard Specifications and Construction Drawings. All installations in excess of 12-feet deep shall require approval of the Utilities Engineer.
- 3002.8 Concrete encasement shall be required where the depth of cut from the ground elevation to the top of pipe is 4-feet or less. Unless otherwise approved by the Utilities Engineer, concrete cradle shall be used when sewer depth exceeds 16-feet with approval by the Utilities Engineer.
- 3002.9 The depth of cover over sewers at channel or creek crossings shall be 4-feet minimum. Steel conduit surrounding the sewer as per Norman Standard Specifications and Construction Drawings shall be used at crossings with less than 4-feet of cover. The steel conduit shall extend a minimum of 10-feet past the top of the bank. Sewers at or above the channel or creek flow line are not recommended and if allowed will require written approval of the Utilities Engineer. Concrete piers for above grade sewers shall, at a minimum, comply with the City's "Standard Specifications and Construction Drawings".
- 3002.10 The following table illustrates the range of sewer easement width for sewers at various depths. Sewer depth is defined as the difference between the finished grade elevation and the pipe invert. Collector sewers are sewers with a nominal diameter of 12-inches or less and may have sewer service taps. Interceptor sewers are sewers with a nominal diameter of greater than 12-inches and may not have sewer service taps.

Easement Width (feet)	Range of Collector Sewer Depth (feet)	Range of Interceptor Sewer Depth (feet)
10	0.0 to 10.0	0.0 to 10.0
15	10.1 to 11.7	10.1 to 11.7
20	11.8 to 13.3	11.8 to 13.3
25	13.4 to 15.0	13.4 to 15.0
30	15.1 to 16.0	15.1 to 16.7

Notes: The easement widths noted above assume the following:

1. For side lot easements, the minimum sewer easement width must be increased to account for the allowable roof overhang(s). No service lines greater than 24-inches will be allowed inside lots.
2. Storm sewers shall not be located within the sewer easement unless approved by the Utilities Engineer.
3. Type C soils and trench side slopes of 1.5 horizontal to 1.0 vertical are assumed above trench shoring of 8-feet. Differing site conditions may require the easement to be larger and subject to approval of the Utilities Engineer.
4. For sewers located adjacent to rights-of-way, the easement width reflected above may be reduced by 5-feet (10-foot minimum width required).

3003 MANHOLES

- 3003.1 The distance between manholes shall be consistent with the most current edition of ODEQ regulations or up to 500-feet with authorization by the Utilities Engineer. Lampholes are not allowed.
- 3003.2 Manholes shall be 4-feet deep minimum, or a special structure will be required. Rim elevation shall be 1-foot minimum, above 100-year flood (1% annual chance of a flood) or high-water level in these areas, and watertight manhole lids shall be installed. Exact manhole rim elevations shall be shown on profile and staked in field. Unless otherwise approved by the Utilities Engineer, all manholes shall have at least 0.10 feet drop across the manhole. Internal drop manholes may be allowed only by authorization by the Utilities Engineer.

3004 CONNECTIONS

- 3004.1 When making new sanitary sewer service connections for all platted lots and at any point where a sanitary sewer service connection is anticipated., the method for connection shall be made by the following in order of descending preference:

- A. Sanitary sewer connections shall be made directly to a manhole in accordance with the City Standard Specifications and Details.
 - B. If connection to a manhole is not possible, an in-line tee shall be installed on a proposed sewer connection line or an ADS Inserta Tee lateral connection fitting, or approved equal on an existing sewer collection line. Looking upstream, all taps to the left shall be installed 10-feet upstream from the property corner and all taps to the right shall be installed 15-feet upstream from the property corner. Fitting size and location or distance from the downstream manhole shall be shown on the plan and profile.
 - C. For long sewer service connections, the Developer or Design Engineer shall have the option to install a single 6-inch public service line with a double 4-inch wye and termination manhole or two 4-inch private service lines. The property line or easement boundary shall demarcate the public and private ownership of the pipe, per City's Standard Specifications and Construction Drawings.
- 3004.2 Design depth shall be based on service line stub-out 1.5-feet below surface, 1 percent minimum grade, and minimum 26-inches from finished floor elevation to top of sewer line service.
- 3004.3 For private sewer service connections to a main with only one size difference, a connection at the manhole is required or a tee fitting must be installed on the existing collector sewer pipe and conform to the City's Standard Specifications and Details.
- 3004.4 Non-standard sewer taps shall be removed, the sewer main repaired, and the tap installed in accordance with the City's Standard Specifications and Construction Drawings.

3005 WASTE STABILIZATION LAGOONS

- 3005.1 Waste stabilization lagoons are not allowed within Norman City limits, unless otherwise approved by the Utilities Engineer.

END OF SECTION 3000

4000: STREETS

4001 GENERAL REQUIREMENTS

- 4001.1 A Maintenance Bond or Irrevocable Letter of Credit shall be posted in an amount based on a percent of the determined amount of construction costs for a period, following completion and acceptance of all improvements, defined as follows:
- A. Privately financed projects: 25% for a three-year period.
 - B. Publicly financed projects: 100% for one-year plus 15% for the succeeding four-year period.
 - C. Should repairs on the either privately or publicly financed projects be necessary during the maintenance bond period, the repairs made shall also be bonded for an additional one-year period from the date of completion and acceptance of the repair work by the City.
- 4001.2 When invasive subsurface investigatory methods, such as “pot holing” operations, are performed to locate existing utilities under an existing street, the following will be required:
- A. Right-of-way permit
 - B. The maximum size of a drilled “pothole” shall be 6 inches in diameter.
 - C. The operations will be performed in locations out of wheel paths.
 - D. A traffic control plan shall be submitted and approved by the City Transportation Engineer, prior to beginning work. Traffic control plans shall comply with City of Norman Standards and the most current version of the Manual on Uniform Traffic Control Devices (MUTCD).
 - E. Holes will be backfilled with 6 inches of sand immediately above the utility and 3000 psi concrete to the street surface. These repairs must be completed within 24 hours.
- 4001.3 Variances and exceptions to the criteria defined herein will be at the discretion of the City Engineer or their designee. Variance or exception requests shall be made to the City Engineer for consideration and determination prior to completion of related design work or execution of work in the field.

4002 TRAFFIC IMPACT OF DEVELOPMENTS

When a development will have a significant impact on the traffic pattern (100 vph increase or as deemed necessary by the City Transportation Engineer) of the adjacent streets, driveways, and intersections, the developer shall provide a traffic impact analysis. The developer shall provide additional traffic lanes and right-of-way width to

the streets or other improvements to mitigate the impact of the development. The City Transportation Engineer shall determine the exact type and quantity of construction required. Each development will be evaluated based on the traffic into and out of the development, the traffic load on the arterial, and current and planned configuration of the arterial, as shown in the City's Comprehensive Transportation Plan and the trip generation rates for the proposed development, including future phases. Traffic Impact Studies shall be prepared in accordance with the guidelines located in APPENDIX A.

All improvements shall be constructed according to the applicable sections within this document.

4003 STREET FUNCTIONAL CLASSIFICATION

4003.1 Highways

Highways are all roadways for which the primary responsibility for maintenance is other than the City of Norman. The function of these roadways is primarily to accommodate long trips between parts of Norman and to connect areas outside of Norman. Highways will, in some instances, serve as both Urban and Rural Arterials. The right-of-way requirements, number of lanes, and shoulder requirements will vary greatly within the highway system.

- A. Freeway: A divided highway with full control of access. The Federal Interstate System is included in this classification.
- B. Turnpike: A divided highway with full control of access, on which a *user fee* or toll is charged for each trip. In Oklahoma, all turnpikes are owned and operated by the Oklahoma Turnpike Authority and are outside the purview of both the Federal Highway Administration and the Oklahoma Department of Transportation.
- C. Expressway: A divided highway with partial control of access.
- D. Gateway/Boulevard/Parkway Scenic Zones: Any highway, generally divided, where special setbacks are imposed, signs are restricted, uniformity of street trees is required and extensive landscaping is encouraged, to enhance the park like setting along the street
- E. Conventional: Any non-divided road, maintained by the Oklahoma Department of Transportation.

4003.2 Urban Streets

Urban streets are all roadways within urbanized Norman. Urbanized Norman includes all currently developed land and all land designated to be served by central utility systems in the most recently adopted land use plan. The right-of-way requirements, number of lanes, and turn lane and median requirements vary widely. Appropriate cross-sections for all classification of urban roadways

are contained within the most current version of the City's Comprehensive Transportation Plan.

- A. Principal Arterial (Urban): Urban principal arterial roadways provide the predominant passageways through the urbanized portions of the community and connect to the regional freeway network, typically providing for curb and gutter drainage. Intersections are provided at all arterial, collector and local roadways and as needed allowing for local land access directly to the facility. Intersections with arterial roadways are typically signalized and provisions made for one or more left turn lanes and occasionally right turn lanes to facilitate the through movements along the arterial. Principal urban arterial roadways are to provide at least two travel lanes in each direction plus a center median area for separations of traffic. The median area may be used to provide channelized left turn lanes, continuous left turn lanes, and/or streetscape. Where traffic operational analyses support the need for greater throughput capacity, a six-lane section may be considered. Access management practices should be employed to minimize the impacts of property access (i.e., driveways) on the principal arterial facility. When transit routes run along urban principal arterials, consideration should be given to providing a bus pullover bay for service at the bus stops to reduce the traffic delay and potential safety implications of buses stopping in the rightmost travel lane to serve passengers. Street lighting should be provided, or provisions for future installation of street lighting, unless adjacent facility lighting exists. Sidewalks, 5 to 10 feet in width, should be provided along both sides of the roadway. With concurrence by the city's Bicycle Advisory Committee (BAC), principal arterials may also incorporate bike lanes within the roadway pavements to enhance the bicycle transportation network, in which case, sidewalks would be limited to 5 feet in width.
1. Includes ALL Highways within or passing through urbanized Norman, and
 2. All non-highway, principal arterials require a minimum of four travel lanes with curb and gutter and a minimum of 100' of right-of-way. Additional lanes, turn lanes, medians and right-of-way may be required based upon traffic generation or unique conditions.
- B. Minor Arterial (Urban): Urban minor arterial roadways provide passageways across segments of the urbanized portions of the community and connect to the regional arterial network, typically providing for curb and gutter drainage. Intersections, signalized as warranted, are provided at all arterial, collector and local roadways and the minor arterial allows for local land access directly to the facility. Intersections with other arterial roadways are typically signalized, as warranted. Minor arterial streets typically have

significant local access needs or closely spaced intersecting local streets, and thus two optional cross sections may be applied:

1. A three-lane section to allow a continuous left turn lane or raised median with left turn lane pockets to facilitate the through movements along the arterial. A special version of this three-lane section would have a reversible center lane that can be allocated to the peak direction of travel by special lane markings and overhead signs.
2. A four-lane section that can accommodate multiple left turns and right turns into adjacent property driveways. At street intersections, the left or right lanes can be dedicated to through lanes or turning lanes as needed for intersection capacity.
3. Bike lanes would be provided on either typical section. Street lighting should be provided, or provisions for future installation of street lighting, unless adjacent facility lighting exists. Sidewalks, 5 to 8 feet in width, would be provided along both sides of the roadway.

C. Collector (Urban): Collector streets are an important part of the urban street network. Collector roadways tie neighborhoods together, within the one-mile grid of development blocks and across the arterial roadways. In industrial and commercial areas, collector streets serve local industrial and commercial streets and would have a thicker pavement section. The network of collectors provides numerous benefits to the transportation system:

1. Focus the entry and crossing of traffic on the arterials, thus minimizing total delay;
2. Allow lower speed/lower volume roadways for shorter-distance local traffic circulation; and
3. Provide bicycle and pedestrian friendly connections between the one-mile grid blocks.

Collector streets should be sufficiently wide to allow for one lane of traffic in each direction and either curbside parking or bike lanes (typically not both), suitable to the needs of the neighborhood and the transportation network. An alternative section for one-way collector roadways would allow for one lane of traffic and both parking and a bike lane. Street lighting, or provisions for future lighting, may be required at the discretion of the City Transportation Engineer or their designee. A minimum 5-foot-wide sidewalk will be provided along both sides of the roadway.

D. Local (Urban): The primary function of local streets is to provide access to and from properties. Local streets feed to and from the collector street network, but occasionally may tie directly to arterial streets. The urban local street will be a 26-foot pavement width, with curb and gutter drainage and minimum 4-foot-wide sidewalks on each side of the street. Street lighting, or

provisions for future lighting, may be required at the discretion of the City Transportation Engineer or their designee.

4003.3 Rural Roads

Rural Roads include all roadways outside of urbanized Norman. The right-of-way requirements, width of lanes, width and types of shoulders, and requirements for turn lanes vary widely. Appropriate cross-sections for all classification of rural roadways are contained within the most current version of the City's Comprehensive Transportation Plan

- A. Principal Arterials (Rural): Rural principal arterial roadways provide the predominant passageways through the rural portions of the community and connect to the regional arterial and freeway network, typically providing for open ditch drainage. Intersections are provided at all arterial, collector and local roadways. Local land access is permissible directly to the rural principal arterial facility. Intersections with arterial roadways may be signalized or stop controlled and provisions should be made for left turn lanes to facilitate the through movements along the arterial. Principal rural arterial roadways are to provide at least one and no more than two travel lanes in each direction plus a center median area for separations of traffic, provision of channelized left turn lanes, sections of continuous two-way left turn lane, and/or streetscape. Access management practices should be employed to minimize the impacts of property access in the rural principal arterial facility. The roadway is to be provided with 10-foot-wide paved shoulders. Rights-of-way should be provided to allow a 10-foot trail along one or both sides of the roadway for urban trail and side path connections to the rural recreational trail network. Street lighting will be located at intersections only. Additional street lighting, or provisions for future lighting, may be required at the discretion of the City Transportation Engineer or their designee.
- B. Minor Arterial (Rural): Rural minor arterial roadways provide passageways across segments of the rural portions of the community and connect to the regional arterial network, typically providing for open ditch drainage. Intersections are provided at all arterial, collector and local roadways and the minor arterial allows for local land access directly to the facility. Intersections with arterial roadways may be signalized or stop controlled and provisions should be made for left turn lanes to facilitate the through movements along the arterial. Minor rural arterial roadways are to provide one travel lane and a 6-foot-wide shoulder in each direction. Access management practices should be employed to minimize the impacts of property access in the rural minor arterial facility. Street lighting will be located at intersections only. Additional street lighting, or provisions for future lighting, may be required at the discretion of the City Transportation Engineer or their designee.

- C. Collector (Rural): Collector streets in the rural areas of Norman can serve as the one-mile grid of streets in the sparsely developed areas near Lake Thunderbird and the Canadian River. Due to the very low traffic volumes, the roadway will consist of the minimal 26-foot width of paved roadway plus a gently graded shoulder area, for safety, that would be unpaved. Sidewalks are typically not provided along rural collector roads. Street lighting, or provisions for future lighting, may be required at the discretion of the City Transportation Engineer or their designee.
- D. Local (Rural): Local streets in the rural areas of Norman serve access to development in the sparsely developed areas near Lake Thunderbird and the Canadian River. Due to the very low traffic volumes, the roadway would consist of the minimal 22-foot width of paved roadway plus a gently graded shoulder area, for safety, that would be unpaved. In a rural estate setting, the 22 feet of pavement may be framed by curb and gutter. Sidewalks are typically not provided along local rural streets. Street lighting, or provisions for future lighting, may be required at the discretion of the City Transportation Engineer or their designee.

4004 PLAN REQUIREMENTS

- 4004.1 All intersections, cul-de-sacs, and other critical locations shall be shown in plan detail at a minimum scale of 1" = 40', including direction of drainage, top of curb elevation at PC's, PT's and high or low points. All curve information and drainage structures shall be shown in detail.
- 4004.2 Where cul-de-sac radii varies so that the distance from face of curb to the right-of-way line is less than 12-feet, an additional easement will be granted to accommodate sidewalks and/or utilities of the necessary width to achieve 12-feet.
- 4004.3 A site plan showing proposed locations and elevations of all utilities shall accompany the street and storm sewer plans.
- 4004.4 The profile may be either three separate profiles or one single profile.
 - A. Three separate profiles: When using three separate profiles, the top and bottom shall show existing property line and proposed top of curb. The middle profile shall show only existing center line profile. Stationing shall be along center line.
 - B. One single profile: When using one single profile both property lines shall be shown along with the proposed top of curb. The center line profile shall not be shown. Stationing shall be along center line. A typical section shall show cross slopes.
- 4004.5 All fill areas within the street right-of-way shall be cross hatched on the profile and notation shall be made that the fill area shall be compacted to a minimum

of 95 percent standard proctor density. When storm sewer pipes are located in fill area, the fill shall be made and compacted to finish grade, then trenched before storm drain excavation.

- 4004.6 Curb returns with elevations shall be clearly labeled on profile.
- 4004.7 Vertical curves in profile shall give the top of curb elevation at the PC, PI, PT and high or low point, at a minimum of interval of 60 feet.
- 4004.8 Storm sewer mains shall be located outside of the proposed street pavement footprint where possible. If through preliminary investigations and driven by limited right-of-way or design constraints such as SCM, it is deemed not feasible to place the storm sewer outside of pavement, the alternative storm sewer line placement shall be in accordance with **Section 5008.2** or as approved by the City Engineer.
- 4004.9 Utility lines (i.e., Petroleum lines, gas lines, franchise utility lines, etc.) shall not be located under street pavement except at crossings. They are not permitted longitudinally down a street or within 3 feet per foot of depth with a minimum of 10 feet of the edge of pavement, unless approved by the City Engineer.
- 4004.10 Cross Sections
 - A. Cross sections shall be required as a part of the construction plans for Capital Projects and when necessary, or as required by the City Engineer, for development plans to reflect more clearly the intent of the design.
 - B. All cross sections for street rights-of-way shall be labeled by station and be drawn to a scale of (1:1, without exaggeration), showing existing ground, existing and proposed utilities, existing and proposed right-of-way and easements, proposed curbs, paving limits, and proposed construction from building line to building line.
 - C. The beginning and ending points of a project shall be stationed and cross sections for both the stations shall be drawn.
 - D. Typical interval between cross sections shall be 50 feet. Additional cross sections shall be included as needed to show driveway slopes and other pertinent information.
 - E. Sufficient roadside information shall be furnished to show that water is not ponded behind curbs or in ditches.
 - F. Scale for cross section sheets shall not be less than:

Cross Section Sheet Scale		
Type	Horizontal	Vertical
Channels	1" = 10'	1" = 5'
Streets	1" = 5'	1" = 5'

4005 TYPICAL SECTIONS

- 4005.1 Typical sections are to be based on the roadway functional classification as defined in **Section 4003** and detailed in the Comprehensive Transportation Plan. For Development plans, the City Standard Specifications and Construction Drawings may be used.
- 4005.2 Typical sections shall be drawn at the same horizontal and vertical scale (1:1).
- 4005.3 Typical sections shall show dimensions, type of materials, layer details, reserve topsoil, temporary and permanent erosion control, compacted thickness, etc.
- 4005.4 All typical sections or notes that are necessary to clearly reflect the design shall be included.
- 4005.5 If not using City Standard typical sections a geotechnical study/investigations shall be required as detailed in **Section 4017**. The developer shall provide geotechnical study/investigation for all areas to be paved. Soil tests during construction shall be submitted to the City Engineer for review. Density tests are required from right-of-way to right-of-way and within easements, if extending beyond right-of-way, during construction.
- 4005.6 If not using City Standard typical sections pavement thickness shall be designed according to **Section 4017**; however, industrial, and commercial pavement sections shall have a minimum thickness of 8 inch asphaltic concrete or 7 inch Portland cement concrete. Residential pavement sections shall have a minimum thickness of 6-inch asphaltic concrete or 6 inch Portland cement concrete.
- 4005.7 Portland cement concrete streets shall have an integrally placed curb of the same mix design as the street paving. If required due to construction sequencing or other outside factors, variance can be requested for placing the curb separate. Curbs shall be in accordance with the *Standard Specifications and Construction Drawings*.
- 4005.8 Joints in Portland cement concrete shall be located in accordance with the American Concrete Institute (ACI) Standards. If deemed appropriate and approved by the City Engineer, the Oklahoma Department of Transportation Pavement Joint Standards may be used on arterial roadways. A joint layout plan shall be provided for concrete roadways for review and approval by the City Engineer or their designee.

4005.9 Joints in Portland cement concrete paving, curbs and gutters shall be constructed in accordance with ODOT and the American Concrete Institute (ACI) Standards unless otherwise accepted by the City Engineer.

4005.10 All concrete shall be in accordance with Sections 414 and 701 of the ODOT "Standard Specifications for Highway Construction" 2019 or the applicable Portland Cement Concrete Pavement and materials spec in the latest edition.

Class	Description	Concrete Uses
AA	4000 PSI, Min. cement 564 LBS/CY	Superstructures
A	3000 PSI, Min. cement 517 LBS/CY	Pavements (all functional classifications) and substructures (pier caps, columns, abutments, retaining walls, and reinforced concrete not requiring Class AA concrete).
AP	3000 PSI, Min. cement 470 LBS/CY	Use Class AP concrete in shoulders, merge areas, and gore areas for Portland cement concrete (PCC) pavements.
C	2400 PSI, Min. cement 395 LBS/CY	Soil Erosion Control Structures.
P	As required by the Contract, Min. cement 564 LBS/CY	Use Class P concrete for precast prestressed concrete members.

4005.11 Asphaltic concrete streets shall have a Portland cement concrete curb and gutter. The curb shall be in accordance with the Standard Specifications and Construction Drawings.

4005.12 All curb sections shall be vertical curb. Mountable type curbs will not be allowed unless accepted for specific sites by the City Engineer.

4005.13 If not using City Standard typical sections Asphaltic Concrete shall be provided in accordance with the geotechnical evaluation as detailed in **Section 4017**. Asphalt shall, where designated by the pavement design, shall be provided as Superpave Types S 3,4, 5 & 6 per the latest edition of the Oklahoma Department of Transportation Standard Specifications for Highway Construction.

4005.14 Where Residential Estate (RE) zoning has been allowed the typical roadway section shall be designed and constructed in accordance with the Standard Specifications and Construction Drawings.

4006 ROADWAY DESIGN

4006.1 Minimum Street Width: Width of streets shall be according to the classifications as provided for in the Norman Comprehensive Transportation plan and the currently adopted Comprehensive Transportation Plan. Width shall be measured from curb face to curb face or from edge of design strength pavement.

Roadway Widths			
Type	R/W*	Pavement	Shoulder
Urban			
Principal Arterial	100'	64' (4-lanes w/ median)	C & G
Minor Arterial	Varies	Varies	C & G
Collector	60'	34' (3-lanes)	C & G
Local	50'	26' (2-lanes)	C & G
Rural			
Principal Arterial	100'	56' (2-lanes)	10' Paved
Minor Arterial	100'	48' (2-lanes)	6' Paved
Collector	100'	26' (2-lanes)	6' Earthen
Local (Section Line)	80'	22' (2-lanes)	4' Earthen
Local (Interior)	50' w/ 25' UE/DE	22' (2-lanes)	4' Earthen

* Roadside ditches and their backslopes should be captured within right-of-way. See section 4006.3.

4006.2 All minor and principal arterial street designs planned within a proposed development, shall be designed, and coordinated under the authority of the City Engineer.

4006.3 Where Residential Estate (RE) zoning has been allowed, the typical pavement section shall be a minimum width of 22 feet with 4 feet earthen shoulders on each side. Additional easements or right-of-way shall be dedicated such that the roadside ditch, including the back slope, can be maintained from within the street right-of-way. Roadside ditches shall be constructed in accordance with the City's Standard Specifications and Construction Drawings.

4006.4 All urban streets shall be constructed with concrete curbs, except as provided for in **Section 4003.2**, in accordance with the Standard Specifications and Construction Drawings.

4006.5 The centerline of paving shall be the centerline of right-of-way where dedication has been made according to the major street plan. All other cases shall be determined by the City Engineer.

- 4006.6 The minimum longitudinal design grade for streets and gutter lines shall be 0.6 percent. The maximum grade for non-arterial streets shall be limited to 8 percent. Where the topography is hilly, steeper grades may be permitted if approved by the City Engineer, up to a maximum of 12 percent, providing they do not exceed 500 feet in length from PT to PC, except in areas near intersections, where the 8% maximum will apply. Longitudinal roadway grades through crosswalks at intersections shall comply with the most current version of the ADA Standards for Accessible Design and by reference, the Public Rights of Way Accessibility Guidelines (PROWAG) for best practice, for allowable cross-slope.
- 4006.7 All vertical and horizontal curves shall be designed according to the current AASHTO Specifications using the criteria of safe stopping sight distance, with the minimum centerline radius on street alignments to be 200 feet.
- 4006.8 Vertical sag curves shall be the minimum length available for the two intersecting grades as defined by the AASHTO publication titled, A Policy on Geometric Design of Highways and Streets (Green Book), current revision. For residential streets, no sag vertical curve shall be used if the algebraic difference between the two intersecting grades does not exceed 1%. For collector streets, sag vertical curve length shall be determined by the "comfort equation" contained in the referenced AASHTO publication.
- 4006.9 Design and posted speed shall be 25 mph on all residential and collector streets and 45 mph on arterial streets. Posted speed shall only be modified by a commissioned speed study through the corridor or as approved by the City Transportation Engineer.
- 4006.10 The minimum radius on roadway functional classification types shall be as defined in the below table:

Minimum Intersection Radii (ft)			
Type	Local	Collector	Arterial
Local	30	30	40
Collector	30	30	40
Arterial	30	30	40

Note: Radii denoted in the table are minimum values only. Truck turning templates should be applied to intersections and larger radii used to avoid curb over-tracking.

Minimum radius on the returns for industrial districts shall be 40 feet, independent of roadway functional classification. Larger radii may be required for industrial districts if approved by the City Engineer.

4006.11 A proposed and existing profile shall be shown beyond the end of all dead-end streets for a minimum of 200 feet to determine a satisfactory grade for future development if applicable.

4006.12 Roadway cross slope shall be 2% (1/4" per foot) on all roadways unless otherwise approved by the City Engineer.

4006.13 Where proposed development is adjacent to an existing arterial street not constructed to the approved width and pavement dimensions of the current edition of the City's Comprehensive Transportation Plan and "*Standard Specifications and Construction Drawings*", the City shall be provided with a geotechnical report detailing the existing condition of the roadway. Information to be provided, at a minimum, will include the type of pavement, thickness of pavement, estimated age of the pavement, type of subgrade, and CBR for the subgrade material. This report will be used to determine if full replacement to centerline will be required as a part of the public improvements for the development. The proposed design shall be approved by the City Engineer or their designee.

4006.14 Temporary End-of-Pavement Sections

- A. A gravel turn-around area will be provided at the temporary end of any street length in excess of 150 feet. The gravel turn-around will consist of either a gravel circle or a T shaped turn-around. The radius of the turn-around will be a minimum of 38-feet, and the gravel thickness will be a minimum of 6-inches. The T turn-around will be as per City Standard ST-35.
- B. Where a temporary end of street is less than 150 feet in length, one of the following shall be installed at the end of the pavement section: either a 12-inch-wide concrete header curb, or an additional 5-feet of asphaltic pavement. In both cases, this end of pavement material shall be removed prior to extending the pavement section.

4007 INTERSECTION DESIGN

4007.1 General

- A. Streets shall intersect one another at right angles (90°) unless topography and other design factors require a waiver by the City Transportation Engineer. Intersections that cannot be at right angles require review and approval by the City Transportation Engineer.
- B. Grades at collector/arterial intersections and 50 foot back of radius points shall not exceed 3% unless greater slopes are deemed necessary and approved by the City Engineer.

- C. For residential and collector streets the portion of the street from the gutter line of the street being intersected to the P.C. (point of curvature) of the curb return (typically 30 feet) shall have a maximum longitudinal grade of 2%. This will allow the crosswalk to meet the requirements of the Americans with Disabilities Act, which has a maximum sidewalk cross slope of 2%. (See Drawing ST-12)

4007.2 Sight Distance Triangle (Vision Triangle)

- A. The intersection sight distance provisions contained in 'A Policy on Geometric Design of Highways and Streets' published by the American Association of State Highway and Transportation Officials (the AASHTO Green Book referenced in **Section 4006: Roadway Design**) are adopted as the presumptive standard applicable to all intersections within the City provided, however, that the Director of Public Works or his designee may, where consistent with public safety, specify greater or lesser intersection sight distances. Unless otherwise required by the Director of Public Works or his designee, all intersections shall be designed, constructed, and maintained in accordance with such sight distance provision. Additionally, no landscaping, fence, utility equipment, wall, or other structure shall be constructed or maintained in the area identified as the sight triangle, nor shall any parking be allowed within the area of the sight triangle unless a sight distance study designates the desired item not to conflict with required visibility. Sight distance variance shall only be granted at the Director of Public Works or his designee's discretion.
- B. Streets shall not be designed with intersections on the inside of horizontal curves or at any location in general where sight distance will be inadequate for drivers to safely enter the traffic flow or cross the street. The minimum distance from an intersection to a curve shall be the applicable minimum sight distance listed below. The Director of Public Works or his designee may make exceptions for especially difficult design circumstances only if visibility easements to provide adequate sight distance are established. In lieu of visibility easements, additional street right-of-way may be dedicated. Minimum intersection design sight distance standards and design procedures shall be as defined in the most current version of the AASHTO "A Policy on Geometric Design of Highways and Streets".
- C. Where stop control is not used, the corner sight distance for residential streets shall be a minimum of 200 feet [300 feet recommended].
- D. To maintain the minimum sight distance, restrictions on height of embankment, locations of buildings, and screening fences may be necessary. Landscaping in the sight distance triangle shall be low-growing and shall not be higher than 3 feet, or lower as needed to satisfy the calculated required sight distance, above the level of the intersecting street

pavements. Tree overhang shall be trimmed to a line at least 8 foot above the level of the intersections.

4007.3 Right-of-Way

- A. Intersections containing principal and minor arterials as classified by the Major Streets and Highways Map of the “Comprehensive Transportation Plan” shall provide a width of one hundred twenty (120) feet of public right-of-way for a distance of two hundred (200) feet from the intersecting right-of-way. Said right-of-way shall then have a one hundred fifty-foot transition from the one hundred twenty-foot width to a one-hundred-foot standard width.
- B. Variations to this right-of-way requirement shall be granted in accordance with the procedure for plat variations contained in the *Subdivision Regulations of the City of Norman, Oklahoma*.

4008 ARTERIAL ACCESS

- A. Direct access to arterial roadways must be avoided wherever possible. For instance, if the development is adjacent to a minor roadway or interior development road, primary access should be to the minor roadway. Direct arterial access shall only be allowed after review and approval by the City Engineer or their designee.
- B. Whenever possible, cross access with an adjoining property must be sought.

If the City Engineer is satisfied that sufficient attempts to secure cross access have been made and that cross access is not possible, and access cannot be provided via another street, driveway access to the arterial may be granted if the minimum corner clearance is met. However, this access will be limited to right turns in and out.

- C. Adequate sight distances will be required at every driveway connecting to an arterial, consistent with Intersection Sight Distance as defined in **Section 4007**: Intersection Design. Any movement for which inadequate sight distance is available will not be permitted.
- D. Each lot will be permitted to have one access driveway, either on the parcel or as part of cross access. Where side streets abut the parcel, the access will be provided from the side street. Additional driveways may be needed and provided under the following conditions:
 1. If the daily traffic volume using the driveway exceeds 2,000 vehicles per day.

2. If traffic using one driveway exceeds the capacity of a single stop-controlled intersection during one peak street traffic hour or the peak site traffic hour.
3. If an approved traffic analysis shows that traffic conditions warrant additional driveways.

- E. In all cases, minimum spacing and clearances shall be provided.
- F. Driveways along arterial roadways must satisfy the following minimum spacing requirements:

Posted Speed	Small Generator	Medium Generator	Large Generator
	0 to 100 peak hour trips	101 to 200 peak hour trips	201 or more peak hour trips
<= 40 MPH	220 Feet	330 Feet	550 Feet
> 40 MPH	330 Feet	440 Feet	660 Feet

Distances are from centerline to centerline of driveway. The Director of Public Works or their designee may, where consistent with public safety, specify greater distances when considering future development and/or future changes to traffic control in order to keep driveways away from queuing areas and thus assure adequate traffic flow through the intersection.

- G. The corner clearance for driveways next to public road intersections, as measured from the edge of pavement of the intersecting roadway to the centerline of the driveway, shall meet the following criteria:

Speeds < 40 MPH		Speeds >= 40 MPH	
Signal Control	Stop Control	Signal Control	Stop Control
175 Feet *	100 Feet	350 Feet*	200 Feet

**The Director of Public Works or his designee may, where consistent with public safety, specify greater distances when considering future development and/or future changes to traffic control in order to keep driveways away from queuing areas and thus assure adequate traffic flow through the intersection.*

4009 DRIVEWAY APPROACH STANDARDS

4009.1 General

- A. A driveway approach sketch shall be submitted with the driveway permit application for review by the Engineering Division.
- B. A variance from the driveway approach standards described in this section and contained in the City's Standard Specifications and Construction Drawings may be granted upon review by the Director of Public Works and City Engineer. During the absence of either the Director of Public Works or

City Engineer, the City Transportation Engineer shall replace the absent party.

- C. A driveway approach installation and/or maintenance not meeting the requirements of the driveway approach standards may be corrected by the City if deemed necessary by the Public Works Department, at the expense of the property owner and after notice to the property owner to correct the problem.
- D. Specifications for all materials used in constructing a driveway approach shall be reviewed by the City Engineer.
- E. All subgrades shall be compacted to 95% standard proctor density *before* any paving material shall be placed.
- F. At the intersection of public roads, driveways shall be located so that the dimension measured along the edge of the travel way between the frontage boundary line (F.B.L.), and the tangent projection of the nearest edge of the driveway is greater than 100 feet (for commercial and industrial driveways) or 30 feet Type I Driveway and 38 feet for Type II Driveway (for residential driveways). (Refer to the *Standard Specifications and Construction Drawings ST-25 & ST-27 respectively*).
- G. All private roads, driveways, or streets serving all development types within the City, shall be constructed to specifications required for local streets unless otherwise directed by the City Transportation Engineer.
- H. All concrete driveway approaches shall use concrete as defined in **Section 4005.10** Class A (3000 psi) concrete and be a minimum of 6 inches thick. All commercial driveways shall be concrete and may be thicker than 6 inches if required by the City Engineer or as indicated by the site-generated traffic and vehicle classification using said drive.
- I. The expansion joint at the right-of-way line may be silicone sealant with backer rod or hot poured joint sealant.
- J. Residential lots with access either to a collector or local street shall not have driveway access to an arterial street. A residential lot at the corner of a local and collector street shall not have driveway access to the collector without the approval of the Director of Public Works.
- K. Every driveway approach shall be connected to a parking pad/drive of the same width or larger than the approach and a minimum of 20 feet deep beyond the Right of Way (ROW) Line (limited by: Zoning Ordinance 22:421.1.3.g. - concerning paving coverage of yard, drainage impact on surrounding properties, utility easement accessibility, collector access or Historic District Impact).

- L. In the Historic District, the minimum driveway width shall be 8 feet and the maximum 10 feet. Also, two strips of concrete, 18 inches wide shall be allowed.

4009.2 Approach Grades

- A. Minimum approach width is 10 feet.
- B. Grades suggested for driveway conditions are as follows:

Driveway Grades				
Element	Driveway Type	Functional Classification		
		Arterial	Collector/ Distributor	Local
Recommended Grades	Residential	Desirable: 0-10%	Maximum: 10%	
	Commercial/Industrial	Desirable: 0-5%	Maximum: 8%	
Change in Grade without Vertical Curve	All	8% or Less	9% or Less	12% or less

- C. The maximum difference between the downward cross slope of the street (usually 2.0% or less) and the upward slope of the driveway approach shall not exceed 12.0% as noted above. Special conditions outside of the above criteria must have approval from the City Engineer.

4009.3 Special Conditions

For specific design considerations, driveway approaches are separated below into two Approach types.

Driveway Approach Types	
Type	Description
I	Driveway approach on street located in agricultural or residential estate zoning
II	Driveway approach on street or areas other than agricultural or residential estate zoning (urban areas)

- A. Type I Driveway Approaches (streets located in agricultural or residential estate zoning)
- Neither the intersection point of the driveway approach with the edge of pavement or the end of drainage culvert pipe shall extend past the projected side property line, unless written permission is given by the affected property owner.
 - The driveway approach shall be constructed using materials listed in the following chart:

Minimum Material Standards

Type I Driveway Materials		
Existing Street	Material	Thickness
Concrete	Concrete	6"
Asphalt	Type S5 Asphalt	7.5"

3. Drainage pipe may be constructed of corrugated metal, HP, or reinforced concrete. The minimum pipe diameter shall be 18" or equivalent.

4. A drainage culvert pipe may not be required if the proposed driveway is located in an area with little to no contributing drainage area and a shallow ditch, 12" depth or less. The City Engineer shall determine if a drainage culvert pipe is not required.

B. Type II Driveway Approaches (streets located in areas other than agricultural or residential estates)

1. All driveway approaches shall consist of concrete (ODOT Class A, 6 sack, 3000 psi, water/cement ratio of 0.48, 1" to 3" Slump), 6" minimum thickness. For driveway thickness of 8" or greater, dowels are required at contraction joints and at joint connection with the street per **Section 2304.4.A.4** of the City's Standard Specifications and Construction Drawings.

2. Connections to the existing curb will meet and match the old curb.

3. Between driveways, construct a minimum 10' width pedestrian safety island at and parallel to the property line.

4. Where the existing pavement is asphalt or concrete with a separate concrete curb and gutter, remove both curb and gutter, then construct drive approach and gutter as one unit.

5. Immediately after finishing operations, curing shall be accomplished by either wetted earth, cotton mats, wet burlap bags, membrane curing compounds, or other methods accepted by the City Engineer.

6. Sawed contraction joints shall be made as soon as the concrete has set firmly enough to support the concrete saw without tracking. The joints shall be filled with rubberized asphalt or other material accepted by the City Engineer.

7. All exposed edges shall be tooled to no less than 1/4" radius (curb backs and slabs).

8. Neither the intersection points of the driveway approach with the edge of pavement or the end of drainage culvert pipe shall extend past the projected side property line unless written permission is given by the affected property owner.

4010 SIDEWALKS

- 4010.1 All sidewalks, pedestrian signalization, or other pedestrian related infrastructure shall be designed to comply with the most current version of the 2010 ADA Standards for Accessible Design and by reference, the Public Rights of Way Accessibility Guidelines (PROWAG), for best practice.
- 4010.2 All sidewalk layouts and designs must be reviewed and approved by the City Engineer or designee. Sidewalk widths shall be 4 feet minimum for local streets and 5 feet for arterial and collector streets. When sidewalk is at the back of curb an additional 1 foot of width shall be added for all roadway classifications. Sidewalks parallel to arterial roads that are designated bike paths shall be 8-10 feet wide.
- 4010.3 Sidewalks shall be required on both sides of local, collector, and arterial streets.
- 4010.4 All sidewalks shall consist of concrete compliant with **Section 4005.10**. Sidewalks shall include pedestrian bridges across creeks, flumes, and streams, where applicable.
- 4010.5 The finished thickness of Portland cement concrete sidewalks shall not be less than 4 inches. Sidewalks across driveways shall not be less than 6 inches.
- 4010.6 Immediately after finishing operations, curing shall be accomplished by either wetted earth, cotton mats, wet burlap bags, membrane curing compounds, or other methods accepted by the City Engineer.
- 4010.7 Plans for sidewalks or trails, within right-of-way, with a decorative or "special" finish shall be submitted to the City Engineer for approval.
- 4010.8 In general for residential streets, sidewalks shall be constructed within the dedicated right-of-way at a distance no less than 1 foot from the abutting property lines, and except at intersections or as reviewed by the City, shall be no less than 3 feet from the outside curb line of the street pavement. However, at the home builders' option with approval from the City Engineer, they may construct the sidewalk where it crosses the driveway approach adjacent to the street to allow more space for parking between the garage and the sidewalk. Sidewalks shall be designed such that they meet future street sections, SCM criteria, and tree requirements.
- 4010.9 Sidewalks must provide access for the safe and convenient movement throughout the corridor, maintaining a consistent "accessible path". Construction of wheelchair ramps shall be in accordance with the City's Standard Specifications and Construction Drawings and compliant with the most current version of the 2010 ADA Standards for Accessible Design and by reference, the Public Rights of Way Accessibility Guidelines (PROWAG) for best practice.

- 4010.10 To accommodate wheelchair passing space, sidewalks less than 5 feet wide shall have at least 5 foot by 5 foot passing spaces located at intervals not to exceed 200 feet. Driveway crossing may be utilized as the 5-foot by 5-foot passing spaces as appropriate, provided that the cross-slope of the driveway on each side of the sidewalk does not exceed 2%.
- 4010.11 Transverse crack control joints shall be placed at intervals not to exceed 5 feet, unless otherwise approved by the City Engineer for specialty designs. Joints shall be tooled or sawed to a depth of 1 inch.
- 4010.12 Expansion joints shall be placed at curbs, driveways, or abutting structures.
- 4010.13 Where sidewalks intersect drainage flumes, the sidewalks shall span the flume per the applicable standard ST-34.
- 4010.14 Detectable warnings shall be required on the end of curb ramps at roadways and major drives or as required by current ADA standards. The detectable warnings shall consist of raised truncated domes with a nominal diameter 0.9-1.4 inches, a nominal height of 0.2 inches and a nominal center-to-center spacing of 1.6-2.4 inches, shall be the full width of the ramp walking surface, 24 inches in length from the end of ramp and shall contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light. The specifications listed here-in shall meet current ADA standards if said standards are revised in the future. The material used to provide contrast should contrast by at least 70%. The City Engineer shall approve the detectable warning material and method of installation or request a pre-approved style of detectable surface to maintain consistency.
- 4010.15 Changes in horizontal alignment of a sidewalk shall be as noted in Standard Drawing No. ST-14b.
- 4010.16 Meandering or undulating sidewalk shall remain in conformance with current ADA standards and should be designed as follows:
- A. Meandering Sidewalk: Sidewalks shall be constructed to be generally parallel to the curb of the roadway or the adjacent property line. If a meandering sidewalk is constructed, it shall be constructed such that a continual travel path parallel to the curb or the property line is maintained unless deviation is required to avoid an existing obstacle. The change in horizontal alignment must be consistent with **Section 4010.15**.

4011 SIGNAGE

- 4011.1 Street and traffic control sign plans shall be prepared by the developer and submitted to the City Transportation Engineer for approval.
- 4011.2 The developer shall be responsible for street name and other traffic control signage in all developments. For public streets, the city will furnish and install

these signs for the developer on the basis of the City's current Sign Expense Chart. For private streets, the developer may, at his option, pay the city for the installation of the signs or hire a private contractor to do the work. Either way, the signs shall meet the requirements outlined in the Manual on Uniform Traffic Control Devices, latest edition and be approved by the City Transportation Engineer.

4011.3 Payment for public street signs shall be made to the City after the final plat is filed. In the case of private streets, either payment to the City or installation of the signs by a private contractor will be required prior to the filing of the final plat.

4011.4 A Work Zone Traffic Control Plan shall be provided to the City Transportation Engineer for review before any work is done on existing streets.

4012 STRIPING

4012.1 Plans for marking of streets requiring striping shall be reviewed by the City Transportation Engineer for approval. The Contractor performing the work shall be approved by City Transportation Engineer.

4012.2 Striping materials shall be in accordance with **Section 2304.7** of the City's Standard Specifications and Construction Drawings and as noted below. Variations or alternative material use requests shall be submitted to the City Transportation Engineer for approval prior to application.

Striping Schedule Of Materials		
Vehicles per Day	Striping Material by Roadway Type	
	Concrete*	Asphalt
Over 4,000	Paint (Multipolymer)	Thermoplastic (90 mil)
1,000 - 4,000	Paint (Multipolymer)	Thermoplastic (50 mil)
Under 1,000	No Striping unless required by the City Transportation Engineer	

* When applying striping to an existing concrete surface, that surface shall be cleaned thoroughly, and paint shall be applied as a surface prime coat before placing Thermoplastic.

4013 LIGHTING

4013.1 General

- A. Streetlights shall be installed by the franchised vendor providing the electrical service.
- B. Street lighting determination shall be based on the roadways functional classification, as defined in **Section 4003**, or as required by the City

Engineer or their designee.

- C. Four basic objectives shall be considered in providing street lighting: aesthetics, traffic safety, security, and public street intersection identification. The objectives to be considered are directly related to the function of the street to be lighted.
 - 1. For principal and minor arterials, the primary objectives are aesthetics and traffic safety.
 - 2. For collector and local roads, the primary objectives are security and intersection identification.
- D. Light poles shall be located a minimum of 5' back of curb or future curb, including left and right turn lanes.

4013.2 Scheduling

Street lighting shall be chronologically integrated with development. Street lighting shall not be installed until all required offsite improvements such as water mains, sanitary sewer mains, paving, and drainage structures are completed and accepted by the City, to avoid conflicts. However, it shall be installed prior to extensive development to avoid interference with private landscaping. A good rule to follow is to order street lighting at the same time that street name signs are ordered. Close coordination with the developer is required for lights to be installed in time to avoid interference with private landscaping.

4013.3 Location and Design

- A. Street light fixtures shall be full cut-off. LED, 3000 Kelvin.
- B. Generally, street lighting shall be installed in all zones except A-1, A-2, and R-E, as development occurs. However, street lighting may be considered in A-1, A-2, and R-E zones if they are bordered or traversed by a major thoroughfare, and if that major thoroughfare has been improved to current City standards.
- C. The following guidelines shall be followed in providing lighting on minor streets and local collectors:
 - 1. One 4,000 lumen streetlight at each street or alley intersection. Streetlights shall not be placed at individual driveways.
 - 2. One 4,000 lumen streetlight at each end of each cul-de-sac or other permanently dead ended street.
 - 3. One 4,000 lumen streetlight at the approximate midpoint of curvilinear streets that prohibit visual contact between intersections.

4. One 4,000 lumen streetlight midway between intersections that are spaced 300' or more apart. Closer spacing would be allowed on curves as approved by the City Transportation Engineer.
 5. The intention of lighting to be installed is for maintenance to be addressed by the utility provider. For this to occur, all fixtures and lighting components, including the poles, must meet the utility providers standards. Failure to do so could result in a situation where the utility provider refuses to maintain the installation(s).
- D. The spacing and sizing of thoroughfare lighting shall be in accordance with the criteria of *Roadway Lighting Handbook*, U.S. Department of Transportation, Federal Highway Administration, current revision.

4013.4 Approvals

- A. Requests for street lighting shall be submitted to the office of the City Transportation Engineer. Lighting for minor streets and local collectors shall be reviewed by the City Transportation Engineer and forwarded to the franchised vendor on forms provided by the vendor. Lighting for minor streets and collectors which are not as specified herein shall require the review of the City Transportation Engineer and the Director of Public Works.
- B. Proposals for thoroughfare lighting shall be submitted in letter or email to the franchised vendor by the City Transportation Engineer, with final allowance to proceed with installation by the Director of Public Works.
- C. The City Transportation Engineer will document in writing reasons for denying a request for lighting.

4014 STRUCTURES AND SPECIFIC DETAILS

- 4014.1 All special structures (those to which a construction standard detail does not exist or a variation from standard is required) shall be sufficiently detailed.
- 4014.2 Special structures shall be drawn to scale unless otherwise specifically noted, for the purpose of information clarification.
- 4014.3 Sufficient details, dimensions and related notes shall be provided for all structures.
- 4014.4 All structures subject to vehicular traffic shall be designed for HS-20 loading.
- 4014.5 All bridge design shall meet the requirements in the latest edition of Standard Specifications for Highway Bridges prepared by AASHTO.

4015 PARKING

- 4015.1 When on-street parking is required, it shall operate as parallel parking unless otherwise approved by the City Engineer. Where on-street angled parking is used, the street shall provide a travel section that is no less than 24-feet wide, the angled parking shall be no closer than 20-feet from the curb return of an upstream or downstream intersection, and the angled parking shall be no closer than 20-feet from the downstream edge of a pedestrian crossing (regardless of whether it is striped with a crosswalk) or within 30 feet of a stop sign.
- 4015.2 New cut back parking areas will be allowed only on roadways carrying less than an average of 1,000 vehicles per day. Where allowed, sufficient maneuvering space for safe backing must be provided. The minimum width of the parking area, measured perpendicularly from the edge of the travel lane, shall be as follows:

Parking Angle	Minimum Width
0 Degrees (Parallel)	10 Feet or 8' CCFBC
30 Degrees	17 Feet
45 Degrees	19 Feet
60 Degrees	20 Feet
90 Degrees (Perpendicular)	18 Feet

Cut back parking areas shall be paved in accordance with the applicable adopted City paving standard. Curb shall be constructed to prevent parked vehicles from encroaching into unpaved areas or sidewalks.

4016 EASEMENT AND RIGHT-OF-WAY

- 4016.1 Easements and rights-of-way shall be clearly dimensioned on the plans. For curved roadways, additional right-of-way may be required to maintain adequate sight distance.

4017 PAVING DESIGN

- 4017.1 Geotechnical Investigation Report
- A. All pavement designs not per the standard drawings shall be supported by a geotechnical investigation report that is performed by a geotechnical engineer that is licensed as a professional engineer in the State of

Oklahoma. Proposed pavement sections that are less than the minimum thickness required by the standards shall be approved by the City Engineer.

- B. The geotechnical investigation shall include a subsurface exploration with adequate sample location coverage that is developed by the geotechnical engineer-of-record for the project. The field investigation shall include test borings, test pits, geophysical soundings, field testing, or other industry-accepted methods to evaluate the subsurface conditions, as appropriate to meet the needs of the project. Test borings shall extend at least 5 feet below the proposed top of pavement.
- C. Laboratory testing shall be included to characterize the United States Soil Classification for each major strata and any substrata that could influence pavement performance. This shall include index testing to characterize moisture, density, plasticity, and grain size. Strength and modulus determination testing shall also be performed, as noted in **Section 4017**.
- D. The results of the geotechnical investigation shall be summarized in a geotechnical report. A copy of the geotechnical report shall be provided to the City.
- E. The report(s) shall provide the recommended pavement thickness and supporting thickness calculation documentation, including the process used to determine the Equivalent Single Axle Load (ESAL) for each load case.

4017.2 AASHTO Method

Street pavements shall be designed based on *Guide for the Design of Pavement Structures*, American Association of State Transportation Officials (AASHTO), 1993 edition and current amendments. Computations shall be performed on an up-to-date version of the computer software program *Pavement Analysis Software*, developed by the American Concrete Pavement Association.

4017.3 Design Parameters

A. Traffic Volumes:

Street Class	ADT	No. Lots
Residential	300-700	50-120
Residential Collector	2,000-6,000	350-1025

Arterial traffic volumes shall be based on the current City Transportation Plan.

B. Truck Traffic Volumes

Truck traffic for various axle loads, accounting for truck traffic during construction, shall be estimated from Table 4017.1.

Table 4017.1: Truck Traffic for Residential & Residential Collector Streets			
(1) Axle Load (K)	(2) Construction (Per Lot)	(3) Occasional (Per Lot Per Yr)	(4) Regular (Per Year)
Tandem:			
18/23/23	36	0.503	104
Single:			
12/22	42	0.123	348
10/18	38	2.68	1456
<i>Note: Traffic volumes are total vehicles per year. Values for each truck category, for input to the paving design software are calculated as follows:</i> Trucks per year = [Col. (2) * No. Lots / Design Period] + [Col. 3 * No. Lots] + Col. (4)			

C. Design Period:

Pavement Type	Design Period
Asphalt pavements	20 years
Concrete pavements	30 years

D. Reliability Factor:

Street Class	Reliability Factor
Residential	65
Collector	85
Arterial	90

- E. Drainage Coefficient:** Except as accepted by the City Engineer for specific conditions, either supported by geotechnical testing or by the inclusion of subgrade drainage, the coefficient of drainage shall be no greater than 1.00
- F. Geotechnical Data:** AASHTO-based pavement design software utilizes the subgrade resilient modulus (M_R) as the basis of its computations. In cases where existing California Bearing Ratio (CBR) or subgrade modulus (k) test data is available, they may be used with prior written approval by the City Engineer. The *Simplified Guide for the Design of Concrete Pavements* (1993) by the American Concrete Pavement Association provides approximate correlations between CBR or k and M_R . Table 4017.2 contains the approximate correlated values but they must be applied with judgement by the engineer-of-record for the project using site-specific data. All

geotechnical parameters used for the pavement design are subject to the approval of the City Engineer.

Table 4017.2: Relationships of Soil Types & Strength Parameters				
Type of Soil	Subgrade Strength	k Value Range (pci)	M _R (psi)	CBR
Silts & clays of high compressibility ¹ natural density	Very Low	50-100	1000-1900	≤ 3
Fine grain soils in which silt & clay size particles predominate (low compressibility) ²	Low	100-150	1900-2900	3-5.5
Poorly graded sands & soils that are predominately sandy with moderate amounts of silts and clays	Medium	150-220	2900-4300	5.5-12
Gravelly soils, well-graded sands, and sand gravel mixtures relatively free of plastic fines	High	220-250+	4300-4850	>12
Source: <i>Simplified Guide for the Design of Concrete Pavements</i> , American Concrete Pavement Association, 1993.				

- G. Material Coefficients: Acceptable coefficients for conversion of depth of various types of materials are presented in Table 4017.3.

Table 4017.3: Layer Coefficients by Layer Type			
Flexible Pavement Layer Type			Layer Coefficient Per Inch of Depth
Surface Course – “S 4 & 5” HMAC			0.44
Base – “S3” HMAC			0.40
Subbase – Modified Subgrade,	CKD	(CBR 24)	0.10
“ ,	Fly Ash	(CBR 40)	0.12
“ ,	Cement	(CBR 100)	0.14
“ ,	Lime	(CBR 24)	0.10
Type A Aggregate			(CBR 100) 0.14
Prepared Roadbed – Compacted Subgrade			0.04

Note: The layer coefficient values in Table 4017.3 are those that are commonly used for these material types. These are values that may be used in the absence of project and/or material specific test data, and the design engineer may consider adjustment of the values based on experience as approved by the City Engineer.

4017.4 Construction Materials Quality Control Inspection & Testing

- A. All street construction projects shall include quality control inspection and testing of materials used for the construction of the subgrade, curb and gutter, and pavement.
- B. The construction materials quality control inspection and testing requirements/frequency shall be as defined by the geotechnical engineer-

of-record or as stated in **Section 2300** of the Standard Specifications and Construction Drawings. In cases where the requirements are in dispute, the City Engineer shall make the final determination of the requirements.

- C. Construction materials testing will be performed by an AASHTO accredited testing laboratory. Test results will be stamped and sealed by a Professional Engineer and provided to the City prior to project acceptance. The construction materials quality control program for streets shall include:
 1. Moisture-density relationship (Proctor curve)
 2. Atterberg limits
 3. Particle size gradation/percent passing No. 200 sieve
 4. In place nuclear density determination with moisture
 5. California Bearing Ratio (CBR)
 6. Concrete strength testing of samples
 7. Slump and entrained air determination
 8. Inspection and verification of reinforcing steel
 9. Inspection/documentation of concrete placement
 10. Inspection/documentation of subgrade stabilization and density
 11. Soundness testing of aggregate materials
 12. Verification testing of asphalt materials and placement
- D. All moisture-density relationship tests shall be based on a five (5) point curve and include at least one index test to document the plasticity (if appropriate) and the percent passing the No. 200 sieve size (for subgrade materials without significant material above the No. 4 sieve) or a particle size gradation curve (for gravelly subgrade soil or granular paving layers).

END OF SECTION 4000

5000: STORMWATER

5001 GENERAL REQUIREMENTS

- 5001.1 If a Stormwater Master Drainage Plan has been adopted for the area under consideration, proposed stormwater drainage systems shall comply with the provisions of the plan.
- 5001.2 A Maintenance Bond, Certificate of Deposit, or cash shall be posted in an amount equal to 25 percent of the determined amount of construction costs for a 3-year period after completion and acceptance of all improvements.
- 5001.3 It shall be the responsibility of all owners of property, whether undeveloped, developed, or undergoing development to:
- A. Mow and provide maintenance of drainage channels and their slopes for that portion of the channel lying within their property line.
 - B. Keep clear all drainage channels within the boundaries of their properties in accordance with the requirements of this article.
 - C. Control all storm water runoff and drainage, erosion and sedimentation from points and surfaces on the property.
 - D. Prevent any and all drainage interferences, obstructions, blockages, or other adverse effects upon drainage, into, through, or out of the property.
 - E. Not alter or otherwise change designed and installed storm water management control systems and not take any action on existing property that shall adversely affect stormwater runoff in any manner contrary to the provisions of this Section, whether temporary, permanent, or a combination thereof.
- 5001.4 Provision of Improvements
- A. The City may require provision of drainage easements, and for provision of improvements, agreements, and/or easements beyond the boundaries of the subdivision, development, or property improvement to facilitate flow of stormwater from or through the property, to avoid damage from changed runoff conditions, to provide continuous improvement of the overall storm drainage system, and to accommodate all drainage conditions or requirements. Where stormwater runoff flows require the logical extension of any street or its associated drainage in order to prevent flooding, ponding, or uncontrolled runoff, the extension shall be provided by the developer.
 - B. During all construction activity and all other non-construction activity developers, property owners, and contractors shall be required to keep

streets, gutters, inlets, drainage pipes, swales, ditches, drainage channels, and all drainage devices and structures clean and free from debris, sedimentation, soil, and any materials. Any failure to meet this requirement shall, upon notice and failure to immediately correct the notified condition, constitute sufficient grounds for initiation of enforcement action, including, but not limited to, stopping all work until correction is completed.

- C. Property owners, developers, or their legal agents, upon receipt of notice by the City of Norman that repair or maintenance is required of privately owned stormwater infrastructure, shall be responsible for effecting such repairs or maintenance within the time specified, or the City shall have repairs and maintenance performed at the expense of the property owner.

5001.5 It shall be the responsibility of the City of Norman to:

- A. Repair and maintain stormwater infrastructure located within or upon rights-of-way and drainage easements dedicated to the City of Norman. However, this does not pertain to platted parcels or subdivisions which shall be maintained by the developer or HOA.
- B. Design, periodically update, and implement a Stormwater Master Plan for drainage, storm water management, and flood control.
- C. Make such necessary improvements of primary and secondary drainage channels that cannot or will not be improved through private development.
- D. Maintain floodway and flood fringe areas that are dedicated public areas, rights-of-way, park lands, or publicly owned buildings or properties.
- E. Maintain all publicly owned drainage channels or systems outside the flood fringe area.

5002 EASEMENTS

- 5002.1 All drainage easements will be shown detailed on the Construction Plans and Final Plat, as well as described in the covenants and restrictions of the development.
- 5002.2 The City may accept dedication of the entire floodplain area for an unimproved channel.
- 5002.3 Adequate restrictive easements or dedicated right-of-way must be provided for access and maintenance of channels and detention ponds.
- 5002.4 The minimum width for all closed storm sewer easements shall be 15 ft or the outside diameter of pipe plus 10 ft, whichever is greater, and the pipe shall be laid in the center of easement.

- 5002.5 Drainage easements for channels or flumes will extend, at a minimum, from left top of bank to right top of bank and require necessary vehicular access to perform maintenance.

5003 DRAINAGE SYSTEM REQUIREMENTS

- 5003.1 All stormwater runoff systems shall be reviewed and accepted by the City Engineer with regard to analysis, design, and construction of drainage facilities. The appropriate public authority shall have the right to maintain or to cause to be maintained the drainage system for its intended purposes. All proposed development within a floodplain must be reviewed and accepted by the Floodplain Permit Committee.
- 5003.2 Drainage facilities, both public and private, shall consist of all elements necessary to convey stormwater runoff from its contact with the earth to its disposition in the Little River, Canadian River, or Lake Thunderbird.
- 5003.3 The stormwater drainage system, both public and private, may consist of storm sewers (which are closed conduits); improved channels constructed in conformity with adopted City Standards; unimproved drainageways left in their natural condition; areas identified within the Water Quality Protection Zone (WQPZ), covered by restricted drainage easements for the purpose of providing overland flow; and all appurtenances to the above including inlets, manholes, junction boxes, headwalls, dissipators, culverts, etc. All portions of the drainage system that exist within dedicated rights-of-way or restricted drainage easements shall be maintained by the the City, unless provided otherwise by agreement or covenant.
- 5003.4 The stormwater drainage system shall be designed to receive and pass the runoff from a 100-year frequency rainstorm within dedicated easements under full urbanization. Full urbanization is defined as the total anticipated development within the project boundaries. The entire flow shall be confined within the stormwater drainage system. The currently adopted Stormwater Master Plan and/or Comprehensive Plan shall be used to identify future land uses to determine Full Urbanization conditions. Other terms such as “fully developed” and “full build-out” are considered interchangeable with “fully urbanized”.
- 5003.5 The stormwater drainage system shall be designed for either of the following conditions:
- A. Convey:
1. A minimum of overland flow capacities to pass the runoff from a 100-year frequency rainstorm under fully urbanized conditions; or

2. The entire runoff from a 100-year frequency rainstorm under fully urbanized conditions shall be contained within the rights-of way. The network of pipes and inlets must be designed to convey the runoff even in the event of blockage or bypass and must be approved by the City Engineer.
 3. The overland flow and bypass system mentioned in **Section 5003.5A.1** and **Section 5003.5A.2** above shall be placed at sump locations and consist of a concrete flume or equivalent product which provides a permanent flowline (i.e., articulated block, turf reinforcement) that can handle design velocities and must be approved by the City Engineer.
- B. When inlets are placed in a sump, an emergency overland drainage easement shall be provided and an overflow route designed to convey the 100-year flows based on 100% clogging of the sump inlet.
 - C. Runoff from areas greater than one half (1/2) acre outside the roadway shall be collected before it reaches the roadway. Parking lots shall have internal drainage systems to reduce concentrated flows into streets. This item does not apply to single family residential lots on local streets.
 - D. Inlets shall be located at intersections to prevent the flow from crossing the intersection. Inlets at intersections shall be located so they do not encroach upon the curb return. The City Engineer may approve alternative designs.
 - E. No storm sewer inlet (as defined in **Section 5007**) shall be permitted at a wheelchair ramp. Stormwater Control Measures (SCMs) such as permeable pavers are not considered storm sewer inlets and may be permitted at a wheelchair ramp with the approval of the City Engineer provided that they meet ADA requirements.
 - F. Drainage areas, runoff from 10-year and 100-year frequency rainstorms, time of concentration, and inlet design for each inlet shall be summarized and tabulated on the plans. This summary table shall also be a part of the drainage report calculations.
 - G. No flumes will be allowed to discharge onto arterials. Flumes discharging onto collectors and local streets are strongly discouraged and shall be allowed by the City Engineer only if there is no other reasonable solution.
- 5003.6 The overland flow portion of the collector system shall be confined to dedicated rights-of-way, or restricted drainage easements to assure that stormwater can pass through the development without inundating the lowest level of any building, dwelling, or structure. Restricted drainage easements shall be shown on the plat. The stormwater runoff from no more than 3 lots or 1/2 acre (whichever is less) shall be allowed to drain onto another lot or between 2 lots. If more lots or areas need to be drained, then an underground storm sewer shall be required.

5004 RAINFALL

5004.1 Introduction

Presented in this section is the design rainfall data to be used for runoff hydrograph calculations and the Rational Method. All hydrological analyses for the City of Norman shall utilize the rainfall data presented herein for calculation of storm runoff.

5004.2 Total Rainfall

NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 8, Version 2.0 (2013), provides total rainfall depths for 100% (1-year) through 0.2% (500-year) storms with storm durations of 5-minutes to 24-hours for the City of Norman and are presented in **Table 5004.1**. These rainfall depth-duration values are for the NORMAN Station ID: 34-6386 and shall be used in all HEC-HMS or other approved models to calculate existing and future development discharges for all frequency storms. NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 8 is updated every 5-10 years. The most current version of this data or its equivalent shall be used. The latest version adopted by NOAA can be obtained on the NOAA website for the NORMAN Station.

**Table 5004.1: Total Rainfall Depths
Noaa Atlas 14, Volume 8, Version 2 (2013)
Norman Station Id: 34-6386**

Duration	Total Rainfall Depths for Norman, Oklahoma - Inches							
	Frequency (Return Period)							
	100% (1-year)	50% (2-year)	20% (5-year)	10% (10-year)	4% (25-year)	2% (50-year)	1% (100-year)	0.2% (500-year)
5-minute	0.43	0.50	0.61	0.71	0.86	0.98	1.10	1.41
10-minute	0.63	0.72	0.89	1.04	1.25	1.43	1.61	2.06
15-minute	0.76	0.88	1.09	1.27	1.53	1.74	1.96	2.51
30-minute	1.11	1.30	1.61	1.88	2.26	2.58	2.90	3.70
1-hour	1.47	1.72	2.15	2.53	3.08	3.54	4.02	5.23
2-hour	1.82	2.14	2.69	3.18	3.91	4.50	5.14	6.76
3-hour	2.04	2.39	3.02	3.59	4.44	5.15	5.91	7.90
6-hour	2.44	2.84	3.57	4.24	5.29	6.18	7.15	9.73
12-hour	2.87	3.29	4.09	4.84	6.03	7.07	8.20	11.30
24 hour	3.30	3.77	4.66	5.52	6.87	8.04	9.33	12.80

Reference Online NOAA Atlas 14, Volume 8, Version 2 Point Precipitation Frequency Estimates for Norman Station ID: 34-6386

5005 RUNOFF

5005.1 Approved Methods

Table 5005.1 contains methods of runoff which analysis may be used for the design of components of the storm drainage system as applicable.

5005.2 Rational Method

A. Formula: The Rational Method is based on the formula: $Q = CIA$

"Q" is defined as the maximum rate of runoff in cubic feet per second. "C" is a runoff coefficient of the area. "I" is the average intensity of rainfall in inches per hour for a duration equal to the time of concentration. The time of concentration is the time required for water to flow from the most remote point of the basin to the point being investigated and to reach a steady state condition. "A" is the contributing watershed area in acres.

Table 5005.1					
Methodology	Applicable For			Minimum Drainage Area	Maximum Drainage Area
	Peak Q (Pipe, Inlet, Culvert)	Pond/Detention Calculations	Volume/Floodplain Calculations		
Rational Method	Yes	No	No	No Min	200 acres
NRCS (SCS) Method	Yes	Yes	Yes	No Min	No Max*
USGS Regression Equations	Yes**	No	No	2 sq. miles	2,000 sq. miles
*Drainage areas should be delineated so that homogeneity of the watershed is maintained and time of concentration flow paths are not wrongfully skewed due to the creation of a "long/skinny" watershed.					
**USGS Regression Equations should only be used for Estimating Peak Flows along the Canadian River and any unregulated stream within Norman, Oklahoma.					

B. Time of Concentration:

1. One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the most remote part of the drainage area to the point under consideration.
2. The time of concentration consists of overland flow time, T_o plus the time of travel, T_f , in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time, T_o , plus the time of travel in a combined form, such as a small swale, channel, or drainage. The latter portion, T_f , of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainage. Overland flow time, on the other hand, will vary with surface slope, surface cover, and distance of

surface flow. The infiltration rate of the soil, the presence of depression storage areas, and the amount of antecedent rainfall will also affect the inlet time, since the rainfall must first overcome these losses before a steady state runoff condition will be achieved. Thus, the time of concentration can be calculated using the following equation:

$$T_C = T_0 + T_f$$

Where,

T_C = time of concentration (minutes)

T_0 = initial, or overland flow time (minutes)

T_f = travel time in the ditch, channel, gutter, storm sewer, etc. (minutes)

Minimum time of concentration, T_C , shall be 5 minutes.

3. The overland flow time, T_0 , in non-urbanized watersheds may be calculated as follows:

$$T_0 = \frac{1.8(1.1 - C)(L_0^{0.5})}{S_0^{0.333}}$$

Where,

C = Runoff coefficient

L_0 = Length of overland flow (feet, 150 feet maximum)

S_0 = Average basin slope (percent)

In lieu of the foregoing, formulas may be used as contained in the *ODOT Roadway Design Manual*, Section 15.3.2.1.

4. The equation for overland flow time, T_0 , is generally adequate for distances up to 150 feet. For longer basin lengths, the runoff will combine, and the sheet flow assumption is no longer valid. The time of concentration would then be overland flow in combination with the travel time, T_f , which is calculated using the hydraulic properties of the swale, ditch, or channel. The time of concentration is then the sum of the initial flow time, T_0 , and the travel time, T_f .

- C. **Runoff Coefficient:** The runoff coefficient, C , represents the integrated effects of infiltration, evaporation, retention, flow routing, and interception, all of which affect the time distribution and peak rate of runoff. Determination of the runoff coefficient requires judgment and understanding on the part of the engineer. Table 5005.2 presents the recommended range of C values for different surface characteristics as well as for different aggregate land uses. Coefficient values selected from the range available shall be consistent with the urbanized percent imperviousness (i.e. minimum percent imperviousness requires minimum runoff coefficient

value). Also, for flat slopes and permeable soils, use the lower values. For steep slopes and impermeable soils use the higher values. A copy of NRCS Soil Survey Map should be included in the drainage report showing soil type(s) and soil hydrologic group.

- D. Intensity: The intensity, I , is the average rainfall rate in inches per hour for the period of maximum rainfall of a given frequency having a duration equal to the time of concentration. For a given time of concentration, T_c , and a given design storm frequency, the rainfall intensity, I , can be obtained using the following equation:

$$I = \frac{d}{(T_c + e)^f}$$

Where,

I = Rainfall Intensity (inches per hour)

T_c = Time of Concentration (minutes)

d, e, f = Parameters defined in Table 5005.3.

TABLE 5005.2 – Runoff Coefficients and Percent Imperviousness for the Rational Method

Land Use or Surface Characteristic	Percent Imperviousness	Runoff Coefficients
BUSINESS:		
Commercial Areas	70 to 95	0.70 - 0.90
Neighborhood Areas	60 to 80	0.50 - 0.70
RESIDENTIAL:		
Single Family	40 to 60	Use percent impervious for runoff coefficient or calculate composite runoff coefficient (0.40 minimum)
Multi-unit (detached)	45 to 55	
Multi-unit (attached)	65 to 75	
1/2 acre lot or larger	20 to 40	
Apartments	65 to 75	
INDUSTRIAL:		
Light Uses	70 to 80	0.50 - 0.80
Heavy Uses	80 to 90	0.60 - 0.90
PARKS, CEMETERIES	4 to 8	0.40 - 0.60
PLAYGROUNDS	10 to 20	0.40 - 0.50
SCHOOLS	40 to 60	0.40 - 0.60
RAILROAD YARDS	35 to 45	0.40 - 0.60
UNDEVELOPED AREAS:		
Cultivated	30 to 70	0.40 - 0.60
Pasture	20 to 60	0.40 - 0.50
Woodland	5 to 40	0.40 - 0.50
Offsite Flow (land use not defined)	35 to 55	0.40 - 0.90
STREETS:		
Paved	90 to 100	0.70 - 0.95
DRIVES AND WALKS	90 to 100	0.75 - 0.90
ROOFS	85 to 95	0.75 - 0.95

* Runoff coefficient to be calculated using actual impervious area and soil type.

Table 5005.3 - Rainfall Intensity Parameters

Design Storm	Parameter		
	d	e	f
2-Year	53	10	0.82
5-Year	64	12	0.79
10-Year	74	12	0.79
25-Year	93	15	0.79
50-Year	104	15	0.79
100-Year	108	15	0.77
500-Year	130	15	0.75

Source: *Drainage Design Manual*, ODOT, November 2014

5005.3 Unit Hydrograph Methods

A. Introduction: Unit hydrograph computations are required for all hydrologic studies when the time of concentration for the entire watershed draining to the point of discharge from the project is greater than 10 minutes. The Soil Conservation Service (SCS) Unit Hydrograph Method is the preferred method. HEC-HMS is the preferred computer program for performing these computations. HEC-HMS is a hydrologic simulation model developed by the US Army Corps of Engineers Hydrologic Engineering Center in Davis, California and is the successor to HEC-1. Other models may be used with the approval of the City Engineer. Table 5005.1 indicates methods applicable to various scenarios and watersheds. This section contains brief explanations of the various hydrograph methods; however, the design engineer is assumed to be familiar with the basic assumptions and limitations regarding the applicability of the method used.

B. Design Storm Precipitation:

1. The design storm for the Norman area shall consists of a 24-hour storm and have a 1-minute unit duration for peak flow calculations.
2. A precipitation hyetograph shall be used as the input for all runoff calculations. The specified precipitation is assumed to be uniformly distributed over the watershed. The hyetograph represents average precipitation depths over a computation interval.

5005.4 SCS Unit Hydrograph Method

A. Introduction

The SCS Unit Hydrograph methodology combines the effect that specific soils and soil cover (i.e., vegetation) have on the runoff from a storm into one parameter called the Soil-Cover Complex Number (CN). For a specific

type of land use, soil type, and cover condition in a watershed, a CN value can be determined. Then, utilizing the total rainfall value and the CN value, the storm runoff volume is calculated from a given total rainfall. Next, the peak flow rate and hydrograph shape are determined by applying the runoff to the SCS dimensionless unit hydrograph which is defined by calculating the lag time of the basin.

When using the SCS unit hydrograph method for a sub basin, the SCS basin lag time shall be used in conjunction with the CN value to determine runoff.

B. Curve Number (CN) Determination

The soil type and vegetative covers of a watershed are generally classified separately. A combination of a specific soil type and a specific cover is referred to as a Soil-Cover Complex Number (CN) and a measure of this complex can be used as a watershed parameter in estimating runoff. The CN for each sub area in the hydrologic analysis can be derived by first determining the classification of the soil, and then choosing the CN value from **Table 5005.4** for the applicable cover type and hydrologic condition.

The local Natural Resources Conservation Service (NRCS) office has soil survey data for Cleveland County. This data was mapped with soil series and complexes and can be obtained on the NRCS website. Generalized soils maps, on a county basis, can also be obtained from the NRCS website. Once the soil series is known, the soil can be placed into the proper hydrologic soil group.

The Soil Conservation Service (SCS) method is presented in detail in Section 4 of the U.S. Department of Agriculture Soil Conservation Service Engineering Handbook and Model Drainage Manual, American Association of State Highway and Transportation Officials, 1991. The SCS publication TR55 may be used for areas up to 2,000 acres.

Proposed Table 5005.4 – Runoff Curve Numbers – SCS Method

Cover Type and Hydrologic Condition	Percent Impervious	Curve Numbers for Hydrologic Soil Group			
		A	B	C	D
Fully Dev. Urban Areas (Vegetation Established)					
<u>Open space</u> (lawns, parks, golf courses, cemeteries, etc.):					
Poor condition (grass cover < 50%)	0	68	79	86	89
Fair condition (grass cover 50% to 75%)	0	49	69	79	84
Good condition (grass cover > 75%)	0	39	61	74	80
<u>Impervious areas:</u>					
Paved parking lots, roofs, driveways, etc.	100	98	98	98	98
Streets and roads:					
Paved with curbs and storm sewers	100	98	98	98	98
Paved with open ditches	80	83	89	92	93
Gravel	100	98	98	98	98
Dirt	80	72	82	87	89
<u>Urban districts:</u>					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
<u>Residential districts by average lot size:</u>					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing Urban Areas (No Vegetation)					
Newly graded areas - no vegetation	0	77	86	91	94

C. Routing of Hydrographs

For all hydrologic studies submitted to the City of Norman which involve routing of sub basin hydrographs, the following routing methods shall be used as indicated and are also provided in **Table 5005.5**:

1. The Kinematic Wave method may be used in channel and storm sewer routings.
2. The Storage-Discharge (Modified Puls) routing shall be used for channel/overbank and reservoir routings.
3. The Lag method may be used for storm sewer flow.

Proposed Table 5005.5 – Approved Routing Methods	
Routing Method	Flow Condition
Kinematic Wave	Flow completely contained in the channel.
	Flow contained in storm sewer
Modified Puls (Storage-Discharge)	Flow completely contained in the channel.
	Flow contained in storm sewer
Lag Method	Flow contained in full storm sewer

5005.5 USGS Regression Equations: The United States Geological Survey (USGS) regression equations for ungauged streams can be found in the USGS publication, *"Techniques for Estimating Flood Discharges for Oklahoma Streams"*, Water Resources Investigation 77-54, U.S. Geological Survey, Water Resources Division, June 1977.

5006 STREET DRAINAGE

5006.1 Criteria for Street Drainage

When the drainage in the street exceeds allowable limits, a storm sewer system is required to convey the stormwater runoff. Use of streets for conveyance of stormwater runoff shall be within the following limitations:

- A. The 100-year fully urbanized flow shall be contained within the right-of-way.
- B. For arterial and collector streets, the depth of street flow is limited to inundation of the outside lane (typically 0.38 feet) during a 100-year frequency rainstorm under fully urbanized conditions.
- C. For residential streets, the depth of street flow is limited to 0.50 feet (6-inches) during a 100-year frequency rainstorm under fully urbanized conditions.
- D. Where sump collection systems are used, an overflow route shall be established in the event of complete blockage of the sump in accordance with **Section 5003.5B**. Additional criteria for storm sewer inlets are in **Section 5007**.

5006.2 Drainage Impact on Streets

- A. Sheet Flow: To minimize the effects of hydroplaning and splashing of sheet flow, the streets of Norman are designed with a 2% (1/4" per foot) cross slope. In addition, for arterial streets, the amount of flow spread permitted in the street is limited to the outside lane before a storm sewer inlet is required (Refer to **Section 5006.1A**). Flow spread (T) is calculated as follows:

$$T = \left[\frac{Qn}{K_u S_x^{5/3} S_l^{1/2}} \right]^{0.375}$$

Where,

T = Width of flow or spread, (ft)

Q = Discharge (cfs)

N = Manning's roughness coefficient

K_u = 0.56

S_x = Cross slope, (ft/ft)

S_l = Longitudinal slope (ft/ft)

- B. Cross Flow: The depth of cross flow permitted in non-arterial streets, where it cannot be avoided, is limited to the top of curb. Cross flow in arterial streets is not permitted and is strongly discouraged for collectors and residential streets. The cross-flow limitations for freeways are determined by the Oklahoma Department of Transportation.
- C. Valley Gutters: Concrete valley gutters are required in asphalt streets when the longitudinal grade is 1% or less. The width of the valley gutter will be determined by the depth required. The maximum slope of the lateral grade shall be 5% when the valley gutter is located at or near a stop sign. When the valley gutter is in mid-block with a speed limit of 25 mph the cross slope shall be a maximum of 3%. No mid-block valley gutters shall be allowed if the speed limit is greater than 25 mph. If a bird bath exists on an asphalt valley greater than 1%, then a concrete valley gutter shall be constructed.

5006.3 Hydraulic Evaluation

A. Curb and Gutter Capacity:

1. The allowable storm capacity of each street section with curb and gutter shall be calculated using the modified Manning's formula:

$$Q = 0.56 \left(\frac{Z}{N} \right) S^{\frac{1}{2}} Y_T^{\frac{8}{3}}$$

Where,

Q = Discharge (cfs)

Z = Reciprocal of the street cross slope (S_x, ft/ft)

Y_T = Depth of flow at the gutter (feet)

S = Longitudinal grade of street (ft/ft)

N = Manning's roughness coefficient

2. Manning's roughness coefficient, N , shall be used according to the applicable construction condition from **Table 5006.1**.

3. When the street cross section has different cross slopes, capacity computation shall take into account the various cross slopes.

- B. Roadside Ditch Capacity:** The capacity of a roadside ditch shall be computed using Manning's equation. The allowable flow over the paved portion of the street is computed according to **Section 5006.3A**. This capacity of the roadside ditch and street capacity are combined to determine the entire street section capacity. The paved street portion contributes to the total capacity only when the depth of flow in the roadside ditch is exceeded for the design storm. For streets with curb and gutter, the maximum allowable depth at the pavement edge shall not exceed the limits set in **Section 5006.1**.

Table 5006.1: Manning's N Values

	CHANNEL/SURFACE TYPE	N VALUE RANGE	RECOMMENDED VALUE
A.	Earth Lined (ditches/canals)		
	1. Clean, weathered	0.018 to 0.025	0.022
	2. Clean, gravel	0.022 to 0.030	0.025
	3. Some weeds	0.022 to 0.033	0.027
	4. Not maintained	0.30 to 0.40	0.035
B.	Grass Lined (manmade)		
	1. Well maintained	0.03 to 0.05	0.03
	2. Poorly maintained	0.05 to 0.10	0.05
C.	Natural Streams	0.025 to 0.10	Note 1
	Overbank Areas	0.03 to 0.20	
D.	Rock Lined		
	1. Ordinary rip rap	0.02 to 0.03	0.02
	2. Gabions	0.02 to 0.03	0.02
	3. Grouted rip rap	0.023 to 0.03	0.027
	4. Slope mattress	0.025 to 0.033	0.028
E.	Concrete		
	1. Float finished/wood forms	0.013 to 0.016	0.015
	2. Slip formed	0.016 to 0.016	0.015
	3. Gunite	0.016 to 0.025	0.015

Note 1 Refer to Chow, V.T., Open Channel Hydraulics, McGraw-Hill Book Company, 1959, Table 5-6

5007 STORM SEWER INLETS

5007.1 Design Criteria

- A. Inlet Types:**

1. Grated inlets without a curb opening are not permitted within the City of Norman streets unless approved by the City Engineer.
2. Inlet types shall be in accordance with the City's Standard Drawings.
3. Allowable inlet types, standards, and clogging factors are shown in **Table 5007.1**.
4. The bicycle safe grates (in combination with a curb opening) are the only grates approved by the City of Norman within the street right-of-way. The Neenah R-3076 Vane Grate, or approved equal, shall be used in the City of Norman.
5. Minimum size shall be 2 hoods and 2 grates.

Table 5007.1 – Allowable Inlet Types and Clogging Factors

Standard No.	Description	Allowable Locations	Inlet Location on Street	On-Grade Clogging Factor	Inlet Location on Street	Sump Clogging Factor
SD 21A SD21B	Recessed 6" Metal Frame Inlet w/Access Manhole Back of Curb - 4' and 8' length	Residential Neighborhood	Continuous Grade	1.0	Sump	0.8
SD21ASD21B	Recessed 10" Metal Frame Inlet w/Access Manhole Back of Curb - 4' and 8' length	Collector or Arterial Streets, Commercial and Industrial Areas	Continuous Grade	1.0	Sump	0.8
SD 11	Non-Recessed Standard Inlets and Grates w/Access Manhole Back of Curb	Street Rehabilitation Projects	Continuous Grade	1.0	Sump	0.7
SD 13	Non-Recessed Standard Reinforced Concrete Storm Sewer Inlets with Cast Iron Curb Openings and Grates	Street Rehabilitation Projects	Continuous Grade	1.0	Sump	0.7
SD 16	Recessed Cast Iron Curb Inlets with grates (no access manhole back of curb)	Residential, Collector or Arterial Streets	Continuous Grade	1.0	Sump	0.7
SD 16	Recessed Concrete Curb Inlets	Residential, Collector or Arterial Streets, outside of a ____' radius	Continuous Grade	1.0	Sump	0.8

Table 5007.1 – Allowable Inlet Types and Clogging Factors

Standard No.	Description	Allowable Locations	Inlet Location on Street	On-Grade Clogging Factor	Inlet Location on Street	Sump Clogging Factor
	without grates with access manhole back of curb					
SD 17, SD 18, SD 19	Standard Drop Inlets (15-inch through 48-inch pipes)	Sump areas in Medians, R/W, drainage easements and reserves			Sump	0.8
SD 20	Standard Three Way Drop Inlet (48-inch pipe)	Sump areas in Medians, R/W, drainage easements and reserves			Sump	0.8
ODOT Standard SMD-4 (R-29)	ODOT Standard Median Drain with Type 1 or Type 2 Grate	Sump areas in Medians, R/W, drainage easements and reserves			Sump	0.6

5007.2 Location of Inlets:

1. Inlets shall be located at all low points in the gutter grade, on side streets at intersections where runoff would flow onto an arterial street or highway, and upgrade of bridges to prevent runoff from flowing onto the bridge deck. Inlets are also required when the allowable depth of flow in the gutter is exceeded.
 2. Inlets at intersections shall be located in such a manner that no part of the inlet will encroach upon the curb return. Inlets on a continuous grade in the interior of a block should be placed upstream of a nearby driveway, if possible. The flowline and top of curb elevations shall be shown on all inlets.
 3. For residential & non-residential streets, the first inlet shall be located no more than 400 feet from the high point in the street profile or at the point where the outside lane would be inundated, whichever is less.
- A. Spacing Between Inlets:** The spacing between inlets shall be such that depths of flow and widths of spread requirements are not violated. Flow spread equations and street design is in **Section 5006**.
- B. Interception and Bypass:**
1. Attempting to intercept all the flow on a street at every inlet leads to a costly storm sewer system. It is more cost effective to allow some portion of the runoff to bypass an inlet and intercept the runoff at the next inlet. Another cost-effective method is to design as many of the inlets as possible to be sump inlets.

2. The type of inlet to be used and the percent of flow to be intercepted at a particular location is left to the judgment of the designer. The objective is to minimize the cost of the storm sewer system while satisfying all of the design criteria.
3. On-grade inlets are required to capture 70 percent of the local flow; allowing no more than 30 percent bypass.
4. Hydraulic design of inlets shall be in accordance with **Section 5007.2** and **Section 5007.3**.

- C. Inlets in Sump Condition: When inlets are placed in a sump, emergency overflow shall be provided as described in **Section 5006.3**.

5007.3 Hydraulic Evaluation of On-Grade Inlets

- A. Recessed 6-inch and 10-inch Metal Frame Curb Opening On-Grade:

1. First determine street cross slope, longitudinal slope, and curb opening height to determine which coefficient values to use.
2. Calculate the flow rate for 100% efficiency as follows:

$$Q_0 = (a + b * Lo)(So)^x$$

Where,

Q_0	=	Largest flow that is captured completely
a	=	-0.35 (for 3/8 per inch or 3% cross slope, 6-inch curb opening), or
a	=	-0.4 (for 1/4 per inch or 2% cross slope, 6-inch curb opening)
a	=	1.25 (for 3/8 per inch or 3% cross slope, 10-inch curb opening), or
a	=	1.0 (for 1/4 per inch or 2% cross slope, 10-inch curb opening)
b	=	0.2 (for 3/8 per inch or 3% cross slope, 6-inch curb opening), or
b	=	0.1 (for 1/4 per inch or 2% cross slope, 6-inch curb opening)
b	=	0.25 (for 3/8 per inch or 3% cross slope, 10-inch curb opening), or
b	=	0 (for 1/4 per inch or 2% cross slope, 10-inch curb opening)
x	=	-0.78 (for 3/8 per inch or 3% cross slope, 6-inch curb opening), or

x	=	-0.7 (for 1/4 per inch or 2% cross slope, 6-inch curb opening)
x	=	-0.5 (for either cross slope, 10-inch curb opening)
Lo	=	Length of opening in feet (4 feet or 8 feet)
So	=	Longitudinal Street grade in percent

3. If Q_t is equal to or less than Q_o , $Q_t = Q_o$

Where,

Q_t = Total approach flow

4. If Q_t is greater than Q_o , Q_c is calculated as follows:

$$Q_a = (c + d * Lo)(So)^x$$

$$Q_c = Q_o + (Q_a - Q_o)[1 - \exp\left\{-\left(\frac{Q_t - Q_o}{Q_a - Q_o}\right)\right\}]$$

Where,

Q_a = The upper limit constant on the captured discharge

c	=	3.9 (for 3/8 per inch or 3% cross slope, 6-inch opening), or
c	=	3.5 (for 1/4 per inch or 2% cross slope, 6-inch opening)
c	=	2.9 (for 3/8 per inch or 3% cross slope, 10-inch opening), or
c	=	3.2 (for 1/4 per inch or 2% cross slope, 10-inch opening)
d	=	1.65 (for 3/8 per inch or 3% cross slope, 6-inch opening), or
d	=	0.8 (for 1/4 per inch or 2% cross slope, 6-inch opening)
d	=	1.8 (for 3/8 per inch or 3% cross slope, 10-inch opening), or
d	=	1.7 (for 1/4 per inch or 2% cross slope, 10-inch opening)

Where,

Q_c = Total capture flow

5. The bypassed flow (Q_b) is that flow greater than Q_c , or

$$Q_b = Q_t - Q_c$$

B. Non-Recessed & Recessed Cast Iron Curb Opening Inlets with Grates On-Grade

1. First calculate the Curb Opening Inlet Capacity.
2. Calculate the length of curb opening (L_t) required for total interception using the following formula:

$$L_t = 0.6Q^{0.42}S^{0.3} * \left[\frac{1}{nSx}\right]^{0.6}$$

3. The inlet efficiency (E) of curb-opening inlets shorter than the length required for total interception is expressed by the following formula:

$$E = 1 - \left[1 - \left(\frac{L}{Lt} \right) \right]^{1.8}$$

Where,

L = Length of curb-opening (ft)

4. The flow captured (Q_i) by the curb inlet is calculated using the following formula:

$$Q_i = E \times Q_t$$

5. Second calculate the Grate Inlet Capacity. Using the flow bypassing the curb opening inlets as Q, the flow spread T, is calculated as follows:

$$T = \left[\frac{Q * N}{(Ku * Sx^{\frac{5}{3}} * Sl^{\frac{1}{2}})} \right]^{0.375}$$

Where,

T = Width of flow or spread, (ft)

Q = Discharge (cfs)

N = Manning's roughness coefficient

Ku = 0.56

Sx = Cross slope, (ft/ft)

Sl = Longitudinal slope (ft/ft)

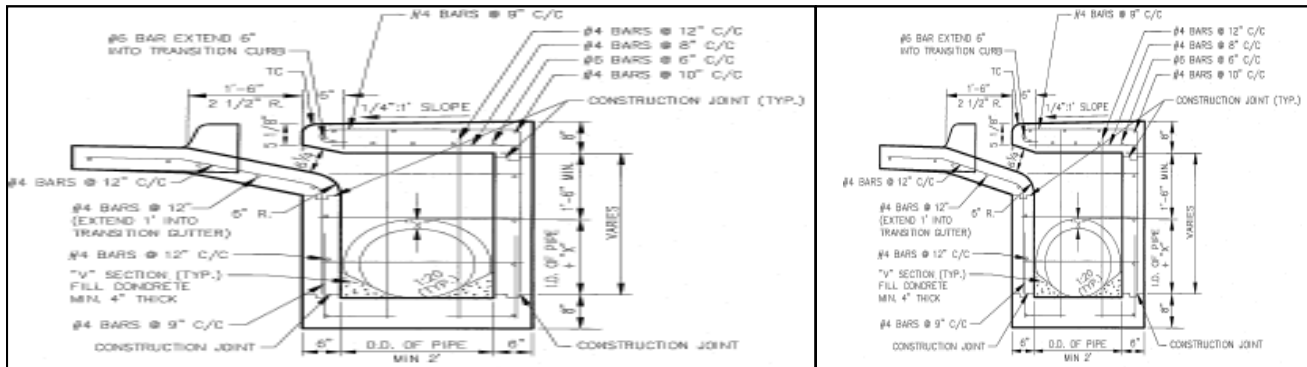
The ratio of frontal flow to total gutter flow (E_o) is computed using the following equation:

$$E_o = 1 - \left[1 - \left(\frac{1.33}{T} \right) \right]^{2.67}$$

The interception capacity of a grate inlet on grade (Q_i) is equal to the efficiency of the grate multiplied by the total gutter flow:

$$Q_i = E_o * Q$$

- C. Recessed Concrete Curb Opening Inlets On-Grade – Only to be used in Rehabilitation Project



1. First calculate (Q_{100}) the flow rate for 100% efficiency using the following formula:

$$Q_{100} = Leff * 0.70 * Yt$$

Where,

Q_{100} = Captured flow for 100% efficiency at $Leff$

$Leff$ = 26 feet (10 foot actual opening)

Yt = Approach depth in the gutter

2. If the approach flow (Qa) is equal to or less than Q_{100} , captured flow (Qc) = Qa
3. If Qa is greater than Q_{100} , Qc is calculated as follows:

$$Lt = \frac{Qa}{0.70 * Yt}$$

Where,

Lt = Effective Length that would be required for 100% capture

$$Qc = Qa \left[0.0526 \left(\frac{Leff}{Lt} \right) + 2.86 \left(\frac{Leff}{Lt} \right) - 1.92 \left(\frac{Leff}{Lt} \right)^3 \right]$$

The bypassed flow (Qb) is that flow greater than Q_{100} , or

$$Qb = Qa - Qc$$

5007.4 Hydraulic Evaluation of Sump Inlets

A. Recessed 6-inch and 10-inch Metal Frame Curb Opening in a Sump:

1. First determine the curb opening capacity which starts in weir flow as follows:

$$Q = 3.1 * L * d^{1.5}$$

Where,

L = Length of curb opening (4' or 8')

d = Depth of flow (ft)

2. At a depth approximately equal to the height of the opening, the flow changes to orifice control and is calculated as follows:

$$Q = 0.65 * A * (2 * g * d)^{0.5}$$

Where,

A = Area of opening (ft²)

g = Gravity = 32.2 ft/sec²

d = Depth of flow above centroid of area (ft)

In the transition zone between weir flow and orifice flow, 1.0-1.4 times the opening height, the smaller of the flow calculations will control.

B. Non-Recessed & Recessed Cast Iron Curb Opening Inlets with Grates in a Sump:

1. To determine the flow intercepted by a single cast iron curb opening with grate in a sump is as follows:

$$Q = 7.22 * d^{0.5}$$

Where,

d = Depth of flow above the grate (ft)

2. To determine the flow intercepted by an additional curb opening can be calculated as follows:

$$Q = 3.1 * L * d^{1.5}$$

Where,

L = Length of curb opening (ft)

d = Depth of flow (ft)

3. Combining the two equations, the total flow intercepted by a cast iron curb inlet with grates in a sump can be estimated by:

$$Q = G(7.22 * d^{0.5}) + T(8.34 * d^{1.5})$$

Where,

Q = Design Flow (cfs)

G = Number of Grates

T = Number of Throats or Additional Hoods

d = Ponding Depth (ft)

C. Drop Inlets in a Sump:

1. First determine the capacity which starts in weir flow as follows:

$$Q = 3.1 * L * d^{1.5}$$

Where,

L = Length of curb opening (ft)

d = Depth of flow (ft)

2. At a depth approximately equal to the height of the opening, the flow changes to orifice control and is calculated as follows:

$$Q = 0.65 * A * (2 * g * d)^{0.5}$$

Where,

A = Area of opening (ft²)

g = Gravity = 32.2 ft/sec²

d = Depth of flow above centroid of area (ft)

In the transition zone between weir flow and orifice flow, 1.0-1.4 times the opening height, the smaller of the flow calculations will control.

5008 STORM SEWER PIPE SYSTEM

5008.1 Introduction

A "storm sewer system" refers to a system of inlets, pipes, manholes, junctions, outlets, and other appurtenant structures designed to collect and convey storm runoff to a defined drainageway. A "drainage system" also includes curbs and gutters, roadside ditches, swales, channels, and detention systems for the control of overland runoff. In general, a storm sewer system is required when other parts of the drainage system no longer have the capacity for additional runoff without exceeding the design criteria.

5008.2 Location of Storm Sewers

Storm sewer shall not be placed within the wheel path of any driving lane of the pavement. The preferred location of the storm sewer is according to the following order of priority listed.

- A. Behind the Curb
- B. Down the Center of the Traffic Lane
- C. On Centerline

The traffic lane is defined as the normal width provided for each lane and delineated by pavement stripes.

5008.3 Design Criteria

A. Design Storm Frequency:

1. The storm sewer system, beginning at the upstream end with inlets, is required when the allowable street capacity (see **Section 5006.1**) or overflow capacity is exceeded for the design storm. The "design storm" for the storm sewer system is the 100-year storm under fully urbanized conditions. Thus, the storm sewer system should be designed to convey flow equal to the difference between the design storm and the capacity within the ROW, to prevent violation of the criteria in **Section 5006.1A**.

B. Construction Materials: Storm sewers within the City of Norman may be constructed using materials, pipes, and appurtenances that meet the requirements of the City's Standard Specifications **Section 2300** and are shown in **Table 5008.1**.

1. Corrugated Polypropylene Pipe (PP): Polypropylene pipe and fittings from 18- through 60-inch shall be of a dual wall configuration and shall meet ASTM F-2881 or AASHTO M-330. Pipe shall be joined using a bell and spigot joint meeting the requirements of ASTM F-2881. The joint shall be watertight according to the requirements of ASTM D-3212. Gaskets shall meet the requirements of ASTM F-477. 18- through 60-inch diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer. Polypropylene pipe is allowed in all storm sewer applications. PP can only be used outside of the roadway limits or perpendicular to the travel way for crossings.
2. Storm sewers within the City of Norman shall be constructed using pipe materials that meet or exceed the Oklahoma Department of Transportation Specifications for Highway Construction, latest edition. All pipe systems shall have joints that meet or exceed ASTM D3212 for water tightness. Manholes and junction boxes shall have watertight connections meeting a field testing of ASTM F2487 and ASTM F1417.
3. Approved pipe material shall meet or exceed ASTM C 443, ASTM C 76, AASHTO M 170. Precast Concrete Boxes shall meet or exceed ASTM C 789 or ASTM C 850. Installation shall be in accordance with ASTM F3212 or AASHTO M330. Pipe cover shall be in accordance with the manufacturer's guidelines.
4. Alternate pipe materials for special applications may be approved if the above specifications are met or exceeded. Watertight pipe joints are highly important as is pipe strength.
5. Minimum Pipe Sizes are provided in **Table 5008.2**
6. Approved Manning's N Values are provided in **Table 5008.3**

7. Approved Manhole spacing and sizes are provided in **Table 5008.4**

Table 5008.1 – Approved Pipe Material and Standards	
Pipe Material	Standard
Reinforced Concrete Pipe	
Round	ASTM C-76 or AASHTO M-170
Elliptical	ASTM C-507 or AASHTO M-207
Joints	ASTM C-443 or AASHTO M-198
Arch	ASTM C-506 or AASHTO M-206
Pre-Cast Concrete Manholes	ASTM C-478 or AASHTO M-199
Pre-Cast Concrete Box	ASTM C-789/C-850, AASHTO M-259/273, ODOT
Concrete Cast-in-Place pipe	ODOT Standard
PVC Pipe	ASTM D-3034 or
Corrugated Polypropylene Pipe	ASTM F-2881 & AASHTO M330

Table 5008.2 – Approved Pipe Size and Standards		
Type	Minimum Equivalent Pipe Diameter	Minimum Cross-Sectional Area
Main Trunk	18-inch	1.77 sq. ft.
Lateral from inlet	18-inch	1.77 sq. ft.

Table 5008.3 – Approved Manning's N Value	
Material	N Value
Concrete	
Pre-Cast (Public)	0.013
Cast-in-Place (Public)	
Steel forms	0.013
Wood forms	0.015
Plastic	
Corrugated Polypropylene	0.022
Corrugated Polypropylene (smooth interior)	0.012
Polyvinyl chloride (smooth interior)	0.011

Table 5008.4 – Manhole Spacing		
Pipe Size	Maximum Spacing for Manholes	Minimum Manhole Size
18" to 24"	300 ft	4 ft
27" to 36"	400 ft	5 ft
42"	400 ft	6 ft
48"	500 ft	6 ft
54" to 60"	500 ft	8 ft
> 60"	500 ft	Junction Structure

C. Vertical Alignment:

1. The sewer grade shall be such that a minimum cover is maintained to withstand AASHTO HS-20 loading on the pipe. The minimum cover depends upon the pipe size, type and class, and soil bedding condition, but shall not be less than two (2) feet from the top of pipe to the finished grade at any point along the pipe. If the pipe encroaches into the street sub-grade, a variance must be granted by the City Engineer.
2. Manholes will be required whenever there is a change in size, alignment, elevation grade and slope, or where there is a junction of two or more sewers. For sewers equal to or larger than 60" diameter, pre-formed smooth transitions shall be approved by the City Engineer. The maximum spacing between manholes for various pipe sizes shall be in accordance with **Table 5008.4**.
3. The minimum clearance between storm sewer and water main (for new construction), either above or below shall be 24". Steel pipe encasing (with proper bedding) of the water line will be required for clearances of 24" or less when the clearance between existing water mains and storm sewer cannot be maintained.
4. The minimum clearance between storm sewer and sanitary sewer (for new construction), either above or below, shall be 24". In addition, when an existing sanitary sewer main lies above a storm sewer, or within 24" below, the sanitary sewer shall have impervious encasement or be constructed of ductile iron pipe for a minimum of 10' on each side of the storm sewer crossing.
5. Siphons or inverted siphons are not allowed in the storm sewer system

D. Horizontal Alignment

1. Storm sewer alignment between manholes shall be straight except when accepted in writing by the City Engineer. Approved curvilinear storm sewers may be constructed using pipe bends or radius pipes.

2. A minimum horizontal clearance of six (6) feet is required between sanitary and water utilities and the storm sewer.

E. Storm Sewer Capacity and Velocity

1. Storm sewer shall be designed to convey the difference between the capacity of the street and the design storm (10-year) flood peaks without surcharging the storm sewer. The sewer may be surcharged during larger floods and under special conditions when approved by the City Engineer.
2. The conduit capacity and velocity shall be based on the Manning's n-values presented in Table 5008.3. The maximum full flow velocity shall be less than 20 fps. Higher velocities may be accepted by the City Engineer if the design includes adequate provisions for uplift forces, dynamic impact forces and abrasion. The minimum velocity in a pipe based on full flow shall be 2.5 fps to avoid excessive accumulations of sediment.
3. The energy grade line (EGL) for the design flow shall be no more than 1-foot above the final grade at manholes, inlets, or other junctions. To ensure that this objective is achieved, the hydraulic grade line (HGL) and the EGL shall be calculated by accounting for pipe friction losses and pipe form losses. Total hydraulic losses will include friction, expansion, contraction, bend, manhole, and junction losses.

F. Storm Sewer Inlets and Outlets

1. Before discharging the runoff from a parking lot of area larger than 0.5 acres, the runoff must first be collected in a storm sewer inlet and connected to the sewer within the street right-of-way, roadway ditch, or drainage conduit. Accordingly, the flow in the street shall be reduced by the amount intercepted by the inlet.
2. All storm sewer outlets into open channels shall be constructed with a headwall and wingwalls or a flared-end-section. When the outlet velocity exceeds six (6) feet per second, erosion control measures shall be taken. If required to prevent erosion, energy dissipaters shall be provided.
3. All storm sewer inlets and outlet structures for detention facilities, will have protective grates, trash racks, screens, or other approved systems utilized to prevent debris and people from entering the system and must be approved by the City Engineer.

G. Riprap Energy Dissipaters

1. Riprap energy dissipaters shall be sized to control erosion at outlets of storm sewer and/or flumes. These energy dissipaters shall be sized accordingly:
 - a. Calculate the mean diameter of riprap required with the following equation:

$$D_{50} = \sqrt{\frac{V}{c \left[2g \left(\frac{\gamma_s - \gamma_w}{\gamma_w} \right) \right]^{\frac{1}{2}}}} = \left(\frac{V}{18} \right)^{\left(\frac{1}{2} \right)}$$

Where,

D_{50} = mean diameter of riprap required (ft)

V = water velocity at outlet (fps)

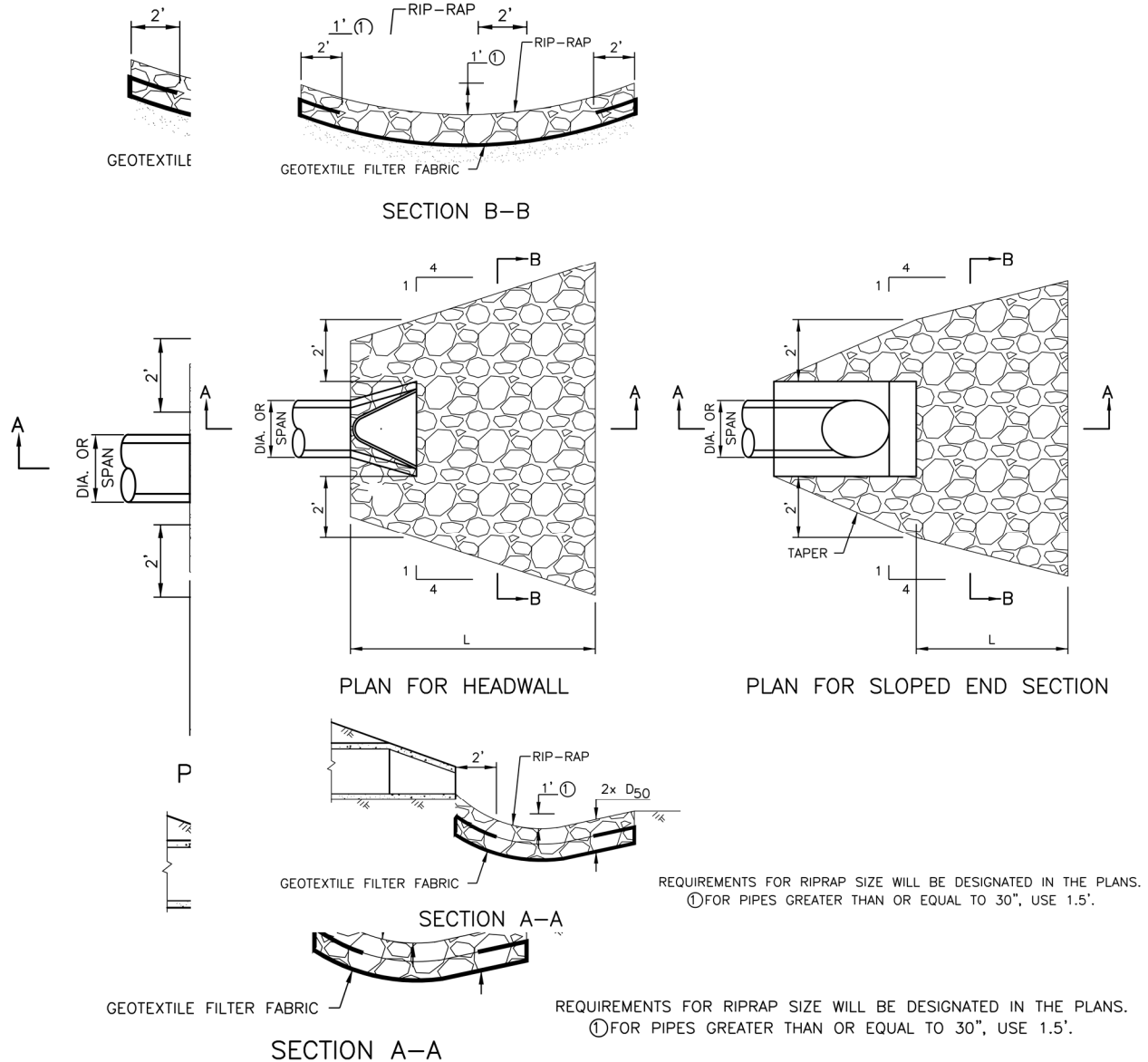
c = stability coefficient (1.8)

g = acceleration of gravity (32.174 ft/s²)

γ_s = saturated surface dry specific weight of stone (165 lb/ft³)

γ_w = unit weight of water (62.4 lb/cf)

- b. For riprap design at Reinforced Concrete pipe outlets, Reinforced Concrete Arch Pipe outlets, or reinforced concrete boxes, the following Figure can be used:



- c. Using the previously calculated D50, the riprap thickness and bedding can be determined using grain size curves found from Figures 3.12 to Figure 3.17 within the Integrated Stormwater Management (iSWM) Technical Manual, Hydraulics, 2014.
- d. Gradations for riprap are located in Table 5008.5 and gradation tables for bedding are located in Table 5008.6.

Table 5008.5 – Riprap Gradation Table	
8" D₅₀ of Riprap	
Sieve Size Square Mesh	Percent Passing
10 Inch	100
8 Inch	70 – 100
6 Inch	50 – 75
3 Inch	20 – 40
1 – ½ Inch	0 – 15
12" D₅₀ of Riprap	
Sieve Size Square Mesh	Percent Passing
15 Inch	100
12 Inch	70 – 100
8 Inch	45 – 75
6 Inch	30 – 55
3 Inch	10 – 30
1 – ½ Inch	0 – 10
18" D₅₀ of Riprap	
Sieve Size Square Mesh	Percent Passing
21 Inch	100
18 Inch	65 – 100
12 Inch	35 – 65
8 Inch	15 – 40
6 Inch	5 – 25
4 Inch	0 – 15
24" D₅₀ of Riprap	
Sieve Size Square Mesh	Percent Passing
30 Inch	100
24 Inch	65 – 100
18 Inch	45 – 75
12 Inch	25 – 50
8 Inch	10 – 30
6 Inch	0 – 15
30" D₅₀ of Riprap	
Sieve Size Square Mesh	Percent Passing
36 Inch	100
30 Inch	65 – 100
24 Inch	45 – 75
18 Inch	25 – 50
12 Inch	10 – 25
8 Inch	0 – 10
36" D₅₀ of Riprap	
Sieve Size Square Mesh	Percent Passing
44 Inch	100
36 Inch	65 – 100
30 Inch	50 – 80
18 Inch	25 – 45
12 Inch	10 – 25
8 Inch	0 – 10

Table 5008.6 – Bedding Gradation Table

Bedding Gradations	
9" D₅₀ of Bedding	
Sieve Size Square Mesh	Percent Passing
6 Inch	100
3 Inch	65 – 100
1 – ½ Inch	40 – 60
¾ Inch	25 – 40
No. 4	0 – 12
6" D₅₀ of Bedding	
Sieve Size Square Mesh	Percent Passing
3 Inch	100
1 – ½ Inch	55 – 100
¾ Inch	25 – 60
3/8 Inch	5 – 30
No. 4	0 – 10

- e. For the following:

L = Length of riprap apron (ft)

D₅₀ = Mean diameter of riprap required (ft)

- f. For discharges from round Reinforced Concrete Pipe outlets, the following Table can be used for riprap dimensions.

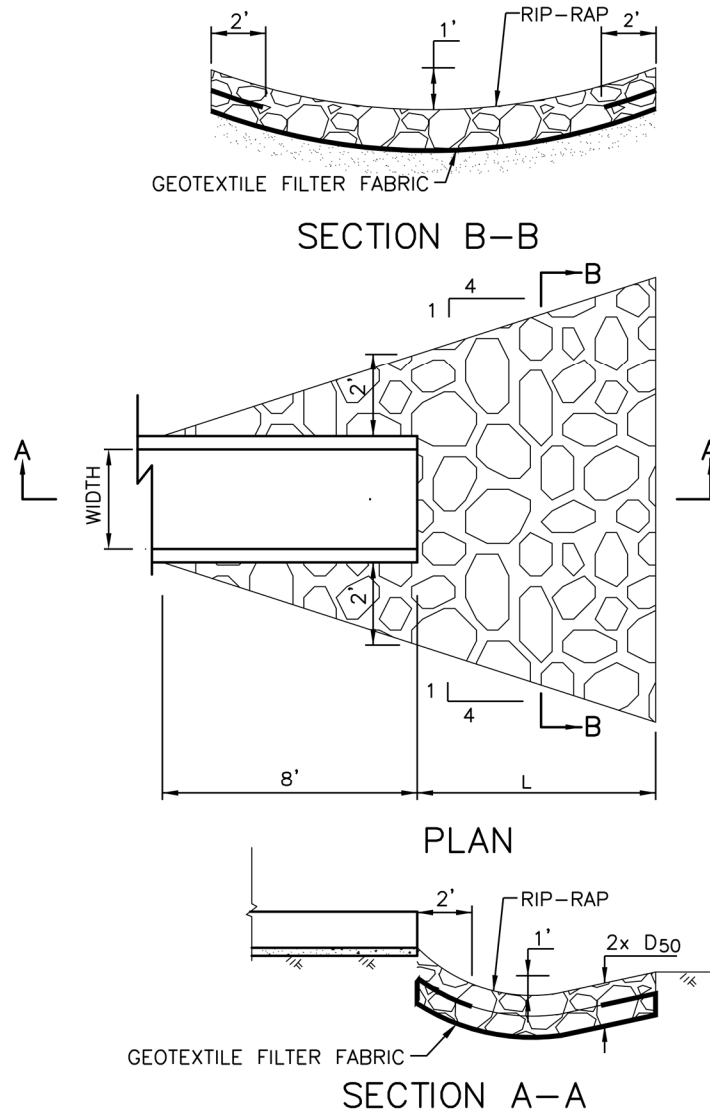
Table 5008.7 – RIP-RAP AT RCP OUTLETS

		CLASS II D₅₀ = 6"	CLASS III D₅₀ = 9"	CLASS IV D₅₀ = 12"	CLASS V D₅₀ = 15"
DIA. OF ROUND PIPE (IN.)	L (FT.)	12" DEPTH RIP-RAP (CU. YDS.)	18" DEPTH RIP-RAP (CU. YDS.)	24" DEPTH RIP-RAP (CU. YDS.)	30" DEPTH RIP-RAP (CU. YDS.)
12	8	2.8	4.1	5.5	—
15	8	2.9	4.4	5.8	—
18	10	3.9	5.9	7.8	—
21	10	4.2	6.3	8.4	—
24	12	5.5	8.3	11.0	—
27	12	5.8	8.7	11.6	—
30	14	7.3	10.9	14.5	—
36	16	9.2	13.8	18.3	—
42	18	10.9	16.3	21.7	—
48	20	12.9	19.4	25.8	—
60	25	—	—	—	36.8

- g. For discharges from Reinforced Concrete Arch Pipe outlets or reinforced concrete boxes of equivalent span, the following Table can be used for riprap dimensions.

Table 5008.8 – RIP-RAP AT RCP-A OUTLETS OR BOXES OF EQUIVALENT SPAN WIDTH				
		CLASS II D ₅₀ = 6"	CLASS III D ₅₀ = 9"	CLASS IV D ₅₀ = 12"
SPAN OF PIPE ARCH (IN.)	L (FT.)	12" DEPTH RIP-RAP (CU. YDS.)	18" DEPTH RIP-RAP (CU. YDS.)	24" DEPTH RIP-RAP (CU. YDS.)
22	10	3.9	5.9	7.8
28	12	5.5	8.2	10.9
36	14	7.2	10.8	14.3
43	16	9.2	13.7	18.3
51	18	10.9	16.3	21.7
58	20	12.7	19.0	25.4

- h. For discharges from concrete flumes, the following Figure and Table can be used for riprap dimensions.



REQUIREMENTS FOR RIPRAP SIZE WILL BE DESIGNATED IN THE PLANS.

TABLE OF QUANTITIES
RIP-RAP AT CONCRETE FLUMES

WIDTH OF CONC. FLUME (FT.)	L (FT.)	CLASS II D ₅₀ = 6"	CLASS III D ₅₀ = 9"	CLASS IV D ₅₀ = 12"	CLASS V D ₅₀ = 15"
		12" DEPTH RIP-RAP (CU. YDS.)	18" DEPTH RIP-RAP (CU. YDS.)	24" DEPTH RIP-RAP (CU. YDS.)	30" DEPTH RIP-RAP (CU. YDS.)
4	15	5.9	8.9	12.1	—
6	18	8.8	13.2	17.7	—
7	20	10.7	16.1	21.5	—

5009 OPEN CHANNELS

5009.1 Channel Design

- A. Design: Channels shall be designed in accordance with sound engineering principles.
- B. Channel Geometry: For trapezoidal channels, the minimum bottom width shall be 4' with side slopes of not steeper than 3.5 to 1 for sodded sections and a minimum bottom width of 3' with side slopes of not steeper than 1:1 for paved or rocklined sections. Where the public may be exposed to hazards and nuisances of open channels, appropriate measures shall be taken to exclude the public from the perilous area.
- C. Manning's N - Value: Manning's Equation in the calculations of hydraulic characteristics of channels will be acceptable. The "N" value used for channels shall be based on the individual channel characteristics, according to **Table 5009.1**. Designers should anticipate growth of trees as a natural maturation process of the channel.

Table 5009.1 Manning's N Value for Open Channels			
CHANNEL/SURFACE TYPE		N VALUE RANGE	RECOMMENDED VALUE
A.	Earth Lined (ditches/canals)		
	1. Clean, weathered	0.018 to 0.025	0.022
	2. Clean, gravel	0.022 to 0.030	0.025
	3. Some weeds	0.022 to 0.033	0.027
	4. Not maintained	0.30 to 0.40	0.035
B.	Grass Lined (manmade)		
	1. Well maintained	0.03 to 0.05	0.03
	2. Poorly maintained	0.05 to 0.10	0.05
C.	Natural Streams	0.025 to 0.10	Note 1
	Overbank Areas	0.03 to 0.20	
D.	Rock Lined		
	1. Ordinary rip rap	0.02 to 0.03	0.02
	2. Gabions	0.02 to 0.03	0.02
	3. Grouted rip rap	0.023 to 0.03	0.027
	4. Slope mattress	0.025 to 0.033	0.028
E.	Concrete		
	1. Float finished/wood forms	0.013 to 0.016	0.015
	2. Slip formed	0.016 to 0.016	0.015
	3. Gunite	0.016 to 0.025	0.015

Note 1 Refer to Chow, V.T., Open Channel Hydraulics, McGraw-Hill Book Company, 1959, Table 5-6

- D. Minimum Slope: Channels shall have minimum slopes of 0.5% for concrete-lined channels and 1.0% for grass-lined channels. The City Engineer's acceptance is required for channels with a flatter slope.
- E. Minimum Velocity: Minimum velocity in a drainageway system, having a roughness co-efficient less than or equal to 0.015, shall be 2.5 fps to avoid sedimentation.
- F. Maximum Velocities: Maximum velocities in channels shall be based on allowable shear stress for channel lining (See K. below). Velocities in concrete-lined or paved sections shall not exceed 15 fps. The dissipation of energy shall be required at the confluence of improved channels with natural channels through the use of dissipaters, stilling basins and etc. which shall be designed in accordance with FHWA HEC #14 Hydraulic Design of Energy Dissipators for Culverts and Channels Drainage Manual.
- G. Freeboard: Where practical, the design water surface elevation shall be kept below the level of natural ground. A 1' freeboard above the energy grade line should be added to calculated flow depths to determine minimum channel depths.
- H. Trickle Channels: All channels altered or improved from the natural state will require a paved trickle channel unless a variance is granted by the City Engineer. Sodding, or other methods of erosion control shall be required adjacent to the paved channel.
- I. Concrete Flumes: Concrete flumes are not allowed to drain onto arterial streets. Concrete flumes in lieu of enclosed pipe shall be allowed as overflow protection for storm sewer systems if no other options are available for residential and collector streets, and to drain areas not exceeding five (5) acres in size. All concrete flumes shall extend to the rear of adjacent lots and shall discharge into a dedicated drainage facility or channel. There are no special freeboard requirements for concrete flumes.
- J. Roadside Ditches: Roadside ditches shall conform with requirements of this section.
- K. Maximum Shear Stress: the maximum shear stress for a straight channel occurs on the channel bed and is less than or equal to the shear stress at maximum depth. The permissible shear stresses can be found in **Table 5009.2**. The maximum shear Stress is computed as follows:

$$t = \gamma dS$$

Where,

t = Maximum shear stress (lb/ft²)

γ = Unit weight of water (62.4 lb/ft³)

d = Maximum depth of flow

S = Average bed slope or energy slope (ft/ft)

Table 5009.2 - Permissible Shear Stresses for Lining Materials		
Lining Category	Lining Type	Permissible Shear Stress
Temporary	Woven Paper Net	0.15 lb/sf
	Jute Net	0.45 lb/sf
	Fiberglass Roving:	0.15 lb/sf
	Single	0.6 lb/sf
	Double	0.85 lb/sf
	Straw with Net	1.45 lb/sf
	Curled Wood Mat	1.55 lb/sf
	Synthetic Mat	2.00 lb/sf
Vegetative	Class A	3.70 lb/sf
	Class B	2.10 lb/sf
	Class C	1.00 lb/sf
	Class D	0.60 lb/sf
	Class E	0.35 lb/sf
Gravel Riprap	1 in	0.33 lb/sf
	2 in	0.67 lb/sf
Rock Riprap	6 in	2.00 lb/sf
	12 in	4.00 lb/sf

5010 HYDRAULIC STRUCTURES

5010.1 Definitions

- A. Culvert:** A culvert is defined as a closed conduit for the passage of water under an embankment, such as a road, railroad, or driveway. Culverts are most commonly used to relieve roadside drainage ditches and to convey stormwater beneath roadways at natural stream and creek crossings.
- B. Bridge:** A bridge is constructed with abutments and superstructures, which are typically concrete, steel, or other materials. Since the superstructures are generally not an integral structural part of the abutments, and are therefore free to move, the hydraulic criteria for bridges is different than for culverts. Bridges are also usually constructed with earth or rock inverts, whereas culverts are typically the same material throughout the waterway opening.

5010.2 Culverts

- A. Construction Materials: Culverts shall be constructed with the approved materials identified in Table 5008.1 Other materials may be used on a case-by-case basis if approved by the City Engineer.
- B. Sizing Method: Culvert design shall follow the methodology presented in *Hydraulic Design of Highway Culverts*, Hydraulic Design Series HDS No. 5, FHWA, U.S. Department of Transportation and *Drainage Manual*, Oklahoma Department of Transportation, 2014.
- C. Design Frequency:
Minimum design frequency for culverts shall be 100-year fully developed conditions within project boundaries.
- D. Culvert Freeboard Requirement:
The calculated hydraulic grade line (HGL) for a culvert must be 1-foot below the subgrade of the road during the 100-year storm event under fully developed conditions.
- E. Culvert Backwater Requirement:
Backwater is defined as the rise in the flood water surface due to the restrictions created by the construction of the culvert. Analysis must be performed to verify no adverse impacts are created due to a backwater condition. The maximum backwater shall be 1-foot with the exception of a FEMA crossing defined in **Section 5010.2G**.
- F. Minimum Sizes:
 - 1. Pipe Culverts - 18" equivalent
 - 2. Box Culverts - no less than 3' in height
 - 3. Other pipe sizes could be approved by the City Engineer.
- G. Culverts contained within FEMA Regulatory Floodway and/or Floodplain must meet FEMA requirements for the following two scenarios:
 - 1. The first situation is for a project on a stream or river that has been studied using detailed hydrologic and hydraulic analyses and for which Base (1-percent-annual-chance) Flood Elevations (BFEs) have been specified, but a regulatory floodway has not been designated. If the community proposes to allow development that would result in more than a 0.05-foot increase in the BFE, a CLOMR must first be obtained from FEMA.

2. The second situation requiring a CLOMR is for a project on a stream or river for which detailed analyses have been conducted and both BFEs and a regulatory floodway have been designated. If the community proposes to allow development totally or partially within the regulatory floodway that would result in any (greater than 0.0 foot) increase in the BFE, a CLOMR must be obtained.

H. Velocity Limitations:

1. In design of culverts both the minimum and maximum velocities must be considered. A minimum velocity of three (3) feet per second at the outlet is required to assure a self-cleaning condition of the culvert.
2. The outlet area shall include a headwall with wingwalls or an end-section in addition to riprap protection. Where outlet velocities exceed six (6) feet per second, erosion control measures and energy dissipators shall be provided as required.

- I. Structural Design: Culverts shall be designed to withstand an HS-20 loading in accordance with the design procedures of AASHTO *Standard Specifications for Highway Bridges* and with the pipe manufacturers recommendations. The minimum cover over top of the pipe shall be 12" unless otherwise accepted by the City Engineer.
- J. Driveway Crossings: Driveway culverts shall be sized to pass the 10-year ditch flow capacity without overtopping the driveway. The minimum size culvert shall be a 18" round pipe, or equivalent, for all streets. Sloped headwalls are required per the City's Standard Specifications and Construction Drawings.

5011 BRIDGES

A. Bridge Freeboard Requirement:

Freeboard for a bridge is defined as the vertical clearance of the lowest structural member of the bridge superstructure above the water surface elevation of the design frequency flood. The minimum freeboard shall be 1-foot for the 100-year frequency flood, unless accepted by the City Engineer.

B. Bridge Backwater Requirement:

Backwater is defined as the rise in the flood water surface due to the restrictions created by the construction of the bridge. The maximum backwater shall be 1-foot as required by the City floodplain regulations with the exception of a FEMA bridge defined in **Section 5011C**.

- C. Bridges contained within FEMA Regulatory Floodway and/or Floodplain must meet FEMA requirements for the following two scenarios:
 1. The first situation is for a project on a stream or river that has been studied using detailed hydrologic and hydraulic analyses and for which Base (1-percent-annual-chance) Flood Elevations (BFEs) have been specified, but a regulatory floodway has not been designated. If the community proposes to allow development that would result in more than a 0.05-foot increase in the BFE, a CLOMR must first be obtained from FEMA.
 2. The second situation requiring a CLOMR is for a project on a stream or river for which detailed analyses have been conducted and both BFEs and a regulatory floodway have been designated. If the community proposes to allow development totally or partially within the regulatory floodway that would result in any (greater than 0.0 foot) increase in the BFE, a CLOMR must be obtained.
- D. Velocity Limitations: The velocity limitations through the bridge opening are controlled by the potential abutment scour and subsequent erosion protection provided. Using riprap for the channel lining and/or protection of the abutments and wingwalls, the maximum channel velocity is limited to 15 fps.
- E. Hydraulic Analysis: The hydraulic design of bridge crossings shall be in accordance with *Drainage Manual*, Oklahoma Department of Transportation, 2014.
- F. Inlet and Outlet Configuration: The design of bridges shall include adequate wingwalls of sufficient length to prevent abutment erosion and to provide slope stabilization from the embankment to the channel. Erosion protection on the inlet and outlet transition slopes shall be provided to protect from the erosive forces of eddy current.
- G. Bridges shall be designed in accordance with AASHTO/ODOT criteria. Rails shall comply with ODOT Standard Details.

5012 STORAGE AND INFILTRATION

5012.1 General

- A. Generally, urbanization results in more impervious areas and a reduction in floodplain storage, both of which contribute to increased flow rates. The development plan shall incorporate permanent, post-construction means (such as basins, ponds, infiltration trenches, dry wells, and porous paving as detailed in **Section 7000:**) to provide for storm water storage, promote storm water infiltration, and reduce erosion and sediment transport.
- B. Peak release rates from developments shall not exceed the existing runoff that occurred before development for all storm frequencies up to and

including the 100-year frequency storm. Releases for 2, 5, 10, 25, 50 and 100-year storms shall not exceed the existing rate. If improvements are made to any natural channel, the existing floodplain storage must be maintained.

- C. The detention storage shall accommodate the excess runoff from a 100-year frequency storm. The excess runoff is that runoff generated due to urbanization which is greater than the runoff historically generated under existing conditions, for a given frequency storm. Detention facilities shall be designed so that the peak rate of discharge does not exceed that of the pre-development conditions for all storm events up to and including 100-year.
- D. Detention facilities can be designed as a “dry pond” which is referred to as a “detention pond” or can be designed as a “wet pond” which is referred to as a “retention pond”.
- E. Detention facilities shall be designed using a unit hydrograph method and in accordance with **Section 5005.3** to assure that there are no adverse impacts to adjacent properties.
- F. Detention facilities can be effective in improving water quality of stormwater runoff. **Section 7000:** details green stormwater control measures (SCM) that can be incorporated into on-site detention facilities.
- G. A fee in lieu of detention may be allowed by the City Engineer under certain conditions in accordance with **Section 5012.4**.

5012.2 Design Criteria

- A. For the design of storage facilities, the methods contained in **Section 5005.3** are approved.
- B. The design storm for detention shall be a 24-hour storm. Rainfall depths shall be in accordance with **Section 5004**.
- C. The time increment used in developing the rainfall distribution and in reading off the ordinates of the unit hydrograph may be rounded off to the nearest whole-time interval or to the nearest time increment.
- D. Rainfall patterns shall be consistent with the modeling technique used.
- E. All calculations for detention facilities shall be submitted for review by the City Engineer. The submittal shall include hydrographs for both existing and

developed conditions, detention facility stage-area-volume relationships, outlet structure details, and a stage versus time analysis through the facility.

- F. Floodplain areas and detention facility locations shall be identified at the preliminary plat stage to illustrate how these areas will be managed during and after construction.
- G. If a tract of land under development has a floodplain area within its boundary, the information that must be furnished with the preliminary plat and shall include:
 1. A 100-year storm backwater analysis on the existing drainage system.
 2. A 100-year storm backwater analysis on the proposed drainageway system
 3. No detention volumes will be allowed that are below the 100-year floodplain or calculated backwater elevations.
- H. Detention facilities should be located in areas acceptable to the City. Each facility shall incorporate methods to minimize erosion and other maintenance reducing designs.
- I. A minimum number of detention facilities is encouraged for each development. Regional detention facilities are encouraged for phased or cooperative development in a drainage basin.
- J. If runoff has a natural tendency to drain in several directions for a given tract of land where detention is required, then detention storage shall be provided for the biggest drainage area. Additionally, a detention storage may be provided, at the same facility, to satisfy detention requirements for a separate drainage area on the same development, provided that;
 1. The whole developmental tract of land is in the same watershed.
 2. The smaller drainage area(s) that, has/have been compensated for does/do not, either singly or in combination, adversely impact the health, welfare and safety of the general public downstream.
 3. The smaller drainage area(s) cannot increase peak flow rates for all storm events up to and including the 100-year event when compared to existing conditions at the same comparison point(s).
- K. If a tract of land being developed is located in more than one watershed, grading work to divert flows from one watershed to another will not be permitted.
- L. The detention area shall be identified as a separate platted area; as appropriate, it may consist of one or more platted lots, a separate block and shall be designated as a drainage easement.

- M. An accessway at least fifteen(15) feet wide for regional detention and ten (10) feet wide for subregional detention shall be provided to any required detention area. Access may be provided by frontage on a dedicated public street or by a dedicated access easement from a dedicated public street to the detention area.
- N. If the detention facility is approved by the City to serve areas outside the subdivision in which it is located, such additional areas shall be specifically identified in the provision for detention.
- O. Any dam or berm shall be designed in accordance with the dam safety criteria of the Oklahoma Water Resources Board.
- P. The maintenance responsibility for on-site detention facilities shall remain with the private sector and appropriate covenants shall be obtained to secure such maintenance.
- Q. All detention facilities utilizing closed conduit systems for the main discharge will be required to have an emergency overflow structure capable of passing the 100-year frequency storm with one (1) foot of freeboard unless more stringent OWRB dam safety requirements control, as outlined in title 785:25-3-3.
- R. Maximum retention or "draw-down" time for detention ponds shall not exceed 24 hours from the time of peak storage to the time of complete emptying or the return to static elevation of the pond, as determined by hydrograph routing or other calculations acceptable to the City. This requirement does not apply to facilities in which retention or "draw-down" time is required to be greater than 24 hours such as an SCM from **Section 7000**:. However, only the portion of the volume within a water quality control available after 24 hours of drawdown time may be used or credited towards detention requirements.

5012.3 Physical Features

- A. Detention dams or dikes shall be constructed as earth filled and non-overflow type dams. Embankment slopes shall not be steeper than 4:1 (horizontal: vertical).
- B. Side slopes on detention and retention facilities shall not be steeper than 4:1.
- C. For retention ponds, the main pool must have a depth from six to eight feet. Areas deeper than eight feet may result in the pond becoming anaerobic, possibly resulting in odors, and are prohibited unless approved by the City Engineer.

- D. For retention ponds, all grading below the static water surface elevation shall not be flatter than 3:1 (horizontal: vertical). Retention ponds shall also consider the use of erosion control measures to further reduce the risk of bank erosion and sloughing. (i.e. Flexamat, Articulated Block)
- E. Storm sewer outlets in the slope of the detention pond shall be protected by a reinforced concrete slopewall.
- F. All earth slopes and earth areas subject to erosion, such as areas adjacent to low flow channels, inlet structures, and outlet structures shall be slab sodded with bermuda sod or protected with other erosion control measures. All other earth surfaces, within the area designated for detention facility site, shall have an established growth of bermuda grass. All covered areas shall be fertilized, watered and in an established growing condition prior to completion and acceptance of the detention facility.
- G. All inlet and outlet structures shall be properly grated and in compliance with **Section 5008.3F.3**.
- H. Parking lot detention is discouraged and only should be used as a last resort as approved by the City Engineer.
 - 1. Where parking lot detention is approved:
 - a. Where parking spaces are designated, the maximum depth of the 100-year storm event under fully developed conditions shall not be greater than 4-inches.
 - b. Where parking spaces are not designated, the maximum depth of the 100-year storm event under fully developed conditions shall not be greater than 6-inches.
 - c. Outlet structure(s) must be in accordance with **Section 5003.5** which restricts the use of flumes discharging onto streets.
- I. Underground Detention is encouraged and must meet the following requirements:
 - 1. Shall be constructed using reinforced concrete pipe, reinforced concrete box culvert, concrete vaults, polypropylene chambers, or other material as approved by the City Engineer. The material thickness, cover, bedding, and backfill shall be designed to withstand HS-20 loading.
 - 2. Inlets to the underground system can be by way of surface inlets and/or a local private storm sewer system.
 - 3. The outlet from the underground detention shall consists of reinforced concrete pipe (RCP) with an 18-inch minimum diameter. The invert of the lower outlet pipe must be set at the lowest point in the underground system. The outlet structure(s) shall discharge into a standard manhole or into a drainage way with erosion protection provided. If an orifice plate is required

to control the release rates, the plate(s) shall be hinged to open into the underground system to facilitate back flushing of the outlet structure(s).

4. A maintenance plan shall be developed and operated by the owner. Access easements shall be provided to facilitate cleaning of the underground system.

5012.4 Fee-In-Lieu of On-Site Detention

- A. Requirement: Detention facilities shall be designed using the City's hydrologic model and hydraulic model for the watershed, if available. All development, including infill development, may pay a fee-in-lieu of onsite stormwater detention, subject to the discretion of the City Engineer depending on its location in the watershed and the potential for adverse impacts. The developer's engineer must submit his or her recommendation for allowing a fee-in-lieu of onsite detention, along with all supporting data.
- B. Also, detention will be required if there is adverse impact from the project as determined by the City Engineer and/or the City's hydrology and hydraulic models.
- C. Contribution amount:
 1. The contribution amount shall be charged per square foot of additional impervious surface in accordance with **APPENDIX D Fee Schedule**.
 2. Fee rate shall be adjusted yearly, based on Engineering News Record Construction Cost Index and recognizing changes in land costs in the Norman area on the annual anniversary of the approval of this *Engineering Design Criteria* document.
 3. Money contributed shall be paid at the following time:
 - a. Prior to the issuance of the permit for paving or storm sewers, whichever is later.
 - b. When the above permit is not required, prior to the issuance of an Earth Change Permit.
 - c. When none of the above permits are required, prior to the issuance of a building permit.
- D. Fee-in-lieu of detention monies contributed by owners as above shall be used for regional and sub-regional detention sites, facilities and maintenance thereof in the watershed in which the development is located.
- E. The boundaries and acquisition of regional and subregional detention sites and construction of detention facilities and location thereof shall be established by the City Engineer and approved by City Council.

END OF SECTION 5000

6000: STORMWATER QUALITY

6001 INTRODUCTION

6001.1 Purpose

The purpose of this Section is to protect, maintain, and enhance the environment of the City of Norman by controlling discharges of pollutants to the City's municipal separate storm sewer system (MS4) and to maintain and improve the quality of the receiving waters into which the stormwater outfalls flow, including, without limitation, the lakes, rivers, streams, ponds, wetlands, sinkholes, and groundwater of Norman.

6001.2 Scope

This Section sets forth uniform requirements to regulate the direct or indirect introduction of pollutants into the MS4 in order for the City of Norman (City) to comply with all applicable state and federal laws including Oklahoma Pollutant Discharge Elimination System (OPDES) and National Pollutant Discharge Elimination System (NPDES) stormwater regulations (40CFR Part 122).

6001.3 Authority of Stormwater Division

The Stormwater Division is responsible for the protection of the health, safety and welfare of the people of Norman by reducing the impact of flooding, erosion, and water pollution through the regulation of non-stormwater discharges to the City's MS4 as well as the management, maintenance and improvement of this system.

- A. With respect to the City's compliance with environmental laws, the Stormwater Division and its authorized representatives may do the following:
 1. Administer the City's compliance with its OPDES MS4 permit to discharge from the municipal separate storm sewer system;
 2. Carry out all inspections, surveillance, enforcement, and monitoring procedures necessary to determine compliance;
 3. Inspect City and commercial (see SIC Codes) properties for the presence of hazardous substances, and develop and administer whatever remediation programs are required;
 4. Audit City departments to determine whether the City is in compliance with Federal and State Clean Water Act laws; whether the City has obtained all permits required by Federal and State environmental laws; and whether the City is in compliance with the permits it has;
 5. Audit use of herbicides, fertilizers, and pesticides to determine compliance and to recommend alternative solutions where practicable for the reduction of their use through education and outreach programs;

6. Control the discharge of spills and the dumping or disposal of materials other than stormwater (e.g., industrial and commercial waste, trash, motor vehicle fluids, leaf litter, grass clippings, animal waste, etc.) into the MS4; provide technical support for spill response;
 7. Administer programs to identify and control pollutants from the transportation, storage, treatment, and disposal of hazardous wastes; and monitor hazardous waste facilities which receive the City's RCRA hazardous waste for treatment or disposal for compliance with NPDES MS4 permit requirements;
 8. Monitor the City's compliance with all Federal, State, and local laws; except that:
 - a. Administering the City's compliance with State and Federal laws relating to discharge from the POTW is the responsibility of the Utilities Department;
 - b. Administering the City's compliance with State and Federal laws relating to the production and distribution of drinking water is the responsibility of the Utilities Department;
 - c. Administering the City's compliance with State and Federal laws relating to the operation of the City's landfill programs are the responsibility of the Utilities Department; and
 - d. Administering the City's compliance with State and Federal laws relating to risk management and safety operations training; programs are the responsibility of the Human Resources Department.
 9. Perform such other administrative duties as may be assigned by the Director.
- B. With respect to enforcement, the Stormwater Division and its authorized representatives may do the following:
1. Investigate violations of and enforce those aspects of the Clean Water Act which are within the authority of local governments;
 2. Investigate violations of and enforce this Section;
 3. Investigate violations of and enforce those provisions that relate to hazardous substances and spills although primary enforcement will remain with the Fire Chief;
 4. Investigate all other violations of and enforce environmental laws within the City's jurisdiction;
 5. Order the stopping of construction of any building or structure, or the alteration, repair or wrecking thereof, if such is being done in a manner that is a violation of this Section;
 6. Enter upon any building, structure, or premises at all reasonable times so as to ascertain the presence of pollutant generating activities;

7. Revoke a permit where it is found that there has been a misrepresentation of facts or a violation of this Section;
 8. Issue citations for violations of this Section upon the direction of the Director of Public Works, or his designee.
 9. Perform other environmental activities as may be required to ensure compliance of environmental regulations by City departments and others within the City of Norman's jurisdiction.
- C. With respect to other programs, the Stormwater Manager and their authorized representatives may do the following:
1. Monitor and coordinate with other City departments on the City's response to releases of hazardous substances;
 2. Create, promote, and publicize educational programs for environmental awareness; and
 3. Provide quantitative data through field screening programs.

6001.4 Monitoring

The Stormwater Division and/or its authorized representatives shall monitor the quantity of, and the concentration of pollutants in stormwater discharges from the areas and locations as designated in the City's Stormwater Management Program (SWMP) and Lake Thunderbird Watershed Total Maximum Daily Load (TMDL) Compliance and Monitoring Plans.

6001.5 Inspections

- A. The Stormwater Division and its authorized representatives, bearing proper credentials and identification, may enter and inspect all properties for regular and/or periodic inspections, investigations, monitoring, observation, measurement, enforcement, sampling, and testing, to effectuate the provisions of this article and the Stormwater Management Program. The Stormwater Division and its authorized representatives shall duly notify the owner of said property or the representative on-site and the inspection shall be conducted at reasonable times.
- B. In the event the Stormwater Division and/or its authorized representatives reasonably believes that discharges from the property into the City's MS4 may cause an imminent and/or substantial threat to human health or the environment, the inspection may take place at any place at any time and without notice to the owner of the property or a representative on-site. The inspector shall present proper credentials upon reasonable request by the owner or representative.
- C. Upon refusal by any property owner to permit an inspector to enter or continue an inspection, the inspector shall terminate the inspection or confine the inspection to areas concerning which no objection is raised. The

inspector shall immediately report the refusal and the grounds to the City Attorney. The City Attorney may seek appropriate compulsory process.

- D. At any time during the conduct of an inspection or at such other times as the Stormwater Division and its authorized representatives may request information from an owner or representative, the owner or representative may identify areas of the property, facility or establishment, material or processes which contains or might reveal confidential information. If the Stormwater Division and its authorized representatives have no clear and convincing reason to question such identification, the inspector shall none the less inspect; however, the inspection report shall note that confidential information. To the extent practicable and permitted by applicable law, the Stormwater Division and its authorized representatives shall not release information which is designated as a confidential information by the Stormwater Division and its authorized representatives. Should the owner or his representative contend certain information to be confidential which has not been so determined or deemed by the Stormwater Division and its authorized representatives, then the owner shall be obligated to seek a declaratory judgement to so protect the alleged confidential information.

6001.6 Enforcement

The Stormwater Division shall take such steps as deemed necessary against any person, business, or entity found in violation of this Section including, but not limited to, the following:

A. Administrative Enforcement

1. Notice of Violation

Any violation of the provisions of this Section may result in the responsible party being issued a Notice of Violation (NOV). The NOV will include a description of the violation and include a reasonable time for the violation to be corrected. Failure to comply with the NOV may result in further enforcement action against the responsible party.

2. Cease and Desist Orders

For any violation of the provisions of this Section, the Director may issue an order requiring the responsible party to cease and desist all violations, to immediately come into compliance with the ordinance and to take any necessary remedial action to reduce or eliminate pollution entering the MS4 from the violation.

3. Administrative Fines

Notwithstanding any other section of this ordinance, any person or entity found to be in violation of this ordinance may be fined as outlined in the schedule of fees.

4. Water Service Severance

Any person, business or entity that violates the provisions of this ordinance may be subject to severance of water service from the City. Service will recommence at the violator's expense when compliance is achieved or written arrangements to correct the violation(s) is submitted to, and approved by, the City.

5. Suspension of Permit Issuance

Any person, business or entity that violates the provisions of this ordinance will be denied the issuance of any other City permits, approvals or inspections until the violation(s) is corrected or written arrangements to correct the violation(s) is submitted to, and accepted by, the City.

B. Injunction and Criminal Prosecution

1. Injunctive Relief

Whenever any person, business or entity violates or continues to violate the provision of this ordinance, the Director may petition the District Court for the issuance of a preliminary or permanent injunction to restrain or compel action on the part of the violator.

2. Criminal Prosecution

Any person, business or entity which violates the provisions of this ordinance shall be liable to criminal prosecution by the City of Norman in Municipal Criminal Court for a maximum penalty of one thousand dollars (\$1000.00) per violation per day and/or imprisonment for a period of not more than thirty (30) days.

3. Remedies Nonexclusive

The provision of **Sections 6001.5 and 6001.6** are not exclusive remedies. The City reserves the right to take any, all or any combination of these actions against violators of this Section.

6001.7 Permit Administration

A. Permit Types

1. Construction Stormwater Discharge Permit

A construction stormwater permit is required for any earth disturbing activity except those exempted in Section 6005.

2. Industrial Stormwater Discharge Permit

An industrial stormwater permit is required for industrial activities operating under a Standard Industrial Classification (SIC) Code identified in Table 1-3 Sectors of Industrial Activity Covered by this Permit of the OKR05 Permit.

B. Permit Application

1. Permittees wishing to obtain permit coverage must submit the following at least thirty (30) calendar days prior to discharge:
 - a. Complete and accurate Notice of Intent (NOI);
 - b. A copy of the ODEQ authorization, if applicable;
 - c. A copy of the SWP3, including a copy of the erosion and sediment control plan if applicable;
 - d. Applicants for construction stormwater discharge permit must also include a map or plat of the premises showing the present contour lines and the proposed contour lines resulting from the earth disturbing activity in relation to all parts of the premises and the properties immediately adjacent thereto and in relation to all abutting street grades and elevations.
 - e. Such map or plat shall show all proposed and existing drainage facilities and the proposed permanent disposition of surface waters upon completion of the land disturbing activity. Any erosion and sediment control plan must comply with the Best Management Practices Manual and shall be reviewed by the Stormwater Division prior to the issuance of the permit.
 - f. The permit application fee and annual permit fee.
2. If the Stormwater Division and its authorized representatives determine that the NOI or SWP3 does not comply with the provisions of this article, the applicant will be notified of all deficiencies.
3. A request for a no exposure certification (NEC) may be made in lieu of obtaining an industrial stormwater discharge permit. Refer to Section 6006.3 for more information.

C. Permit Transfer

1. The transfer of permit coverage shall not relieve the owner/operator of any liability or criminal prosecution for any violations occurring before the transfer is completed.
2. A stormwater discharge permit may be transferred to a subsequent owner/operator only if:
 - a. There are no changes in the operation of the facility which may affect the quantity or quality of the stormwater runoff.
 - b. The current owner/operator is in compliance with all permit conditions at the time of transfer.
 - c. The subsequent owner/operator files an amended NOI containing all of the subsequent owner/operator's required information.

3. If there are to be any changes in the operation of the facility which may affect the quantity or quality of stormwater runoff, then the subsequent owner/operator shall apply for a separate stormwater discharge permit prior to assuming operation of the facility.

D. Permit Application Fee and Annual Permit Fee

1. Permit Application Fees

- a. Earth change permit application fee shall be assessed in accordance with **APPENDIX D Fee Schedule**.
- b. Industrial stormwater discharge permit application fee shall be assessed in accordance with **APPENDIX D Fee Schedule**.
- c. The annual permit fee shall be assessed in accordance with **APPENDIX D Fee Schedule**.

2. Annual Permit Fee

- a. The permittee shall submit the required annual permit fee on an annual basis no later than July 1.

E. Permit Termination

Permittees wishing to terminate permit coverage must submit a complete and accurate Notice of Termination (NOT). The permittee's authorization to discharge will be terminated when the City's termination notification has been issued.

1. Earth Change Permit Termination

An NOT must be submitted within 30 calendar days after one or more of the following conditions have been met:

- a. Final stabilization has been achieved on all portions of the site for which the permittee is responsible;
- b. For residential subdivision only: final stabilization has been completed and the ownership of all lots has been transferred to new owners and the permittee is no longer responsible for the construction activities for the subdivision. A Notification of Change of Ownership (NCO) has been signed, and included in the SWP3; and
- c. When another operator has assumed control over all areas of the site that have not been finally stabilized. The NOT must be submitted with the new operator's NOI.

2. Industrial Stormwater Discharge Permit Termination

An NOT must be submitted within 30 calendar days after one or more of the following conditions have been met:

- a. A new owner or operator has assumed responsibility for the facility;
or

- b. Operations at the facility have ceased and there are not or no longer will be discharges of stormwater associated with industrial activity from the facility.
3. If there are any post-construction stormwater runoff controls that will be left in place, see **Sections 6006 and 7000**; a maintenance plan must be included with the NOT.
4. In the event that any person holding a permit violates the terms of the permit or this Section, the City may revoke or suspend the permit and require a stoppage of all work on site until all violations are corrected. Any person engaged in activities regulated by this Section without first obtaining the required permit will be required to stop all work on site until a permit is obtained.

F. Signatory Requirements

1. The NOI, NOT, and NEC must be signed as follows:
 - a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or (ii) the manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit applications; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures; or
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively (Note: for limited liability company (LLC): by one of its owners, called managing members/partners of the company); or
 - c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

2. All reports, including the SWP3 and any changes to the SWP3, must be signed by the person described in 6001.7.1 or their duly authorized representative. A person is a duly authorized representative only if:
 - a. A signed and dated authorization completed by the person described above is included in the SWP3; and
 - b. The authorization specifies either an individual or the position having responsibility for the overall operation of the regulated facility or activity.
3. Any person signing any document required by this Section shall make the following certification:
 - a. "I certify under the penalty of law that I have personally examined and am familiar with the information submitted in the attached document; and, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete, I am aware that there are significant penalties for submitting false information, including the possibility of a fine and/or civil penalty."

G. Retention of Records

Appropriate proof and records of compliance with the provisions of a stormwater discharge permit, including copies of SWP3(s), reports, and monitoring, shall maintained for a period of at least three years from the date that the permit is terminated.

6002 DISCHARGES TO IMPAIRED WATERS

Throughout the United States there are thousands of waters listed for impairments from stormwater sources. The most common pollutants coming from stormwater sources include sediment, pathogens, nutrients and metals. These impaired waters need a TMDL, which identifies the total pollutant loading that a waterbody can receive and still meet water quality standards, and specifies a pollutant allocation to specific point and nonpoint sources.

The TMDL is implemented in part via the OPDES/NPDES stormwater permitting system. States and EPA Regions have used a variety of methods to develop stormwater-source TMDLs during the past decade. With the expansion of OPDES/NPDES stormwater regulations to smaller municipalities and smaller construction activities, there has been increasing demand for more detailed quantification of stormwater allocations in TMDLs that are more useful for implementation in OPDES/NPDES permits.

6003 ILLICIT DISCHARGES AND IMPROPER DISPOSAL

The Stormwater Division shall take appropriate steps to detect and eliminate illicit connections to the MS4, including the adoption of a program to screen illicit discharges and identify their source or sources, programs to provide for public education and public

information, and other appropriate activities to facilitate the proper management and disposal of used oil, toxic materials, and hazardous household waste.

6003.1 Types of Authorized Discharges

The following discharges are allowed unless they are determined by the Director of Public Works (Director) to cause contamination of stormwater, surface water or groundwater; cause overload or damage to the MS4; endanger public health and safety; or cause the City to violate its ODEQ issued stormwater permit or any applicable state or federal permit:

- A. Diverted stream flows;
- B. Uncontaminated discharges from riparian areas and wetlands;
- C. Uncontaminated ground water or spring water;
- D. Residential building wash water that does not use detergents, solvents, and/or soaps;
- E. Uncontaminated pumped ground water;
- F. Uncontaminated ground water infiltration;
- G. Uncontaminated discharges from potable water sources, including water line flushing and fire hydrant flushing;
- H. Foundation drains;
- I. Air conditioning condensate;
- J. Water from crawl space pumps;
- K. Footing drains;
- L. Residential, non-commercial, and charity car washing;
- M. Landscape irrigation and lawn watering, provided all pesticides, herbicides, and fertilizers have been applied in accordance with the approved manufacturers' instructions and/or labeling;
- N. Uncontaminated and dechlorinated swimming pool discharges provided the discharge is done in such a way to minimize impacts to water quality and neighboring properties;
- O. Street wash water, including wash water generated from the washing of other impervious surfaces such as sidewalks and parking lots, that does not use detergents, solvents, and/or soaps;

- P. Discharges in compliance with a separate OPDES or NPDES permit;
- Q. Discharges of gray water from municipal splash pads (aka, spray parks or spray grounds), as defined in 27A O.S. § 2-6-107, unless otherwise permitted or regulated by DEQ, provided the discharges comply with all applicable municipal or county ordinances enacted pursuant to law (discharges from recirculating systems shall be dechlorinated); and
- R. Discharges or flows from emergency firefighting activities or training activities that are not taking place at a permanent facility.

6003.2 Prohibited Discharges

It is prohibited to discharge, allow to discharge, or cause the discharge of any of the following to the MS4:

- A. Non-stormwater discharges except those listed in **Section 6003.1**.
- B. Any material other than stormwater, which is stored, spilled, or disposed of in such a manner that causes pollutants to be discharged, such as discarded building materials, soil, silt, sediment, vehicle wash water, litter, yard waste, chemicals or any other pollutant.
- C. Any illicit discharge.

6004 CONSTRUCTION STORMWATER RUNOFF CONTROL

6004.1 Earth Disturbing Activities

All earth disturbing activities shall be in compliance with and permitted under this Section and performed in such a manner as to minimize erosion and the discharge of sediment and other pollutants into the MS4. All such activities are also subject to the requirements of the City of Norman Engineering Design Criteria and Standard Specifications and Construction Drawings as incorporated by reference in Section 16-101 of the City of Norman Code of Ordinances and may also be subject to the requirements of the Oklahoma Department of Environmental Quality's (ODEQ) General Permit for Stormwater Discharges from Construction Activities Within the State of Oklahoma, OKR10, if the earth disturbing activity occurs on an area greater than or equal to one (1) acre or is part of a larger common plan of development or sale that will disturb an acre or greater. To seek coverage under OKR10, a Notice of Intent must be submitted to ODEQ.

For the purposes of this Section, the phrase "earth disturbing activity" is defined as follows:

Any land change which may result in soil erosion from water and wind and the movement of sediments into the MS4 or Waters of the State or onto lands and

roadways within the community, including, but not limited to, clearing, dredging, grading, excavating, transporting, stockpiling, mining, and filling of land, except that the term shall not include the following:

- A. Such minor land disturbing activities as home gardens and individual home landscaping, home repairs, home maintenance work, and other related activities which result in minor soil erosion;
- B. The construction of single-family residences when built separately on lots less than one acre not within a subdivision or which have been recorded in the Office of Stormwater Quality Management, and have been issued building permits; provided that excavation is limited to trenches for the foundation, basements, service and sewer connections, and minor grading for driveways, yard areas and sidewalks, with no offsite discharge of pollutants;
- C. Individual service and sewer connections for single-or two-family residences;
- D. Agricultural practices involving the establishment, cultivation or harvesting of products of the field or orchard, preparing and planting of pasture land, forestry land management practices including harvesting, farm ponds, dairy operations, and livestock and poultry management practices, and the construction of farm buildings;
- E. Any project carried out under the technical supervision of the Soil Conservation Service of the United States Department of Agriculture;
- F. Installation, maintenance and repair of any underground public utility lines when such activity occurs on an existing hard-surface road, street or sidewalk, provided the activity maintains pollution control and is confined to the area of the road, street or sidewalk which is hard-surfaced and a street, curb, gutter, or sidewalk permit has been obtained; and
- G. Construction, repair or rebuilding of tracks of a railroad company;
- H. No person may engage in any earth disturbing activities, including but not limited to land clearing, developing, grading, excavating, paving, landfilling, berming or diking without first obtaining an Earth Change Permit from the City of Norman. Such permit shall be required in addition to any building permit or other permit required by the City of Norman for the site. The permit will remain in effect until earth disturbing activities have ceased and permanent erosion control measures, including establishment of vegetative cover, are complete, and a Notice of Termination is submitted or permit coverage is transferred to a new responsible party.

6004.2 Permit Requirements

No earth disturbing activity shall be conducted within the City except in such a manner that complies with the most current OKR10 permit, in addition to the following:

- A. All streets and storm sewers are kept free of sediment, discarded building material, litter, chemicals, fuels, or fluids. BMPs must be maintained in good and effective condition at all times. BMPs may not be modified or removed without first obtaining approval from the City.
- B. Stripping of vegetation, re-grading and other development activities shall be conducted so as to minimize erosion. Clearing and grubbing must be held to the minimum necessary for grading and equipment operation. Pre-construction vegetative groundcover shall not be destroyed, removed or disturbed more than ten (10) days prior to grading or earth moving. Construction must be sequenced to minimize the exposure time of cleared surface area;
- C. Upon completion of land disturbing activities, slopes will not be left so that they will erode. Such methods shall include re-vegetation, sodding, mulching, rip-rapping or guniting. Regardless of the method used, the objective will be to leave the site as erosion-free and maintenance-free as practicable;
- D. Whenever feasible, natural vegetation shall be retained, protected and supplemented;
- E. Permanent or temporary soil stabilization is applied to disturbed areas to the extent feasible within seven (7) days on areas that will remain inactive for more than fourteen (14) days. Permanent soil stabilization with perennial vegetation shall be applied immediately after final grading is reached on any portion of the site. Soil stabilization refers to measures that protect soil from the erosive forces of wind, raindrop impact and flowing water, and includes the growing of grass, sod, application of straw, mulch, fabric mats, and the early application of gravel base on areas to be paved;
- F. A permanent vegetative cover shall be established on disturbed areas not otherwise permanently stabilized;
- G. Sediment in stormwater runoff trapped by the use of debris basins, sediment basins, silt traps or similar measures until the disturbed area is stabilized; Any debris basins, sediment basins, silt traps, or similar 500measures shall be stabilized above water level (including all slopes, banks, areas of deposition, inlets, and outlets).
- H. Neighboring persons and property are protected from damage or loss resulting from excessive stormwater runoff, soil erosion or deposition upon property or public streets of water-transported silt and debris. Adjacent

property owners shall be protected from land devaluation due to exposed bare banks;

- I. A controlled construction entrance/exit is maintained in a condition that will prevent tracking or flowing of sediment onto the public right-of-way. Tracked out sediment must be removed by the end of the workday;
- J. Erosion and sediment control measures must be in place and functional before earth moving operations begin and must be constructed and maintained throughout the construction period. Temporary measures may be removed at the beginning of the workday, but must be replaced at the end of the workday;
- K. Structural controls shall be designed and maintained as required to prevent pollution. All surface water flowing toward the construction area shall, to the extent practicable, be diverted by using berms, channels or sediment traps as necessary. Erosion and sediment control measures shall be designed according to the size and slope of disturbed or drainage areas to detain stormwater runoff and trap sediment. Discharges from sediment basins and traps must be through a pipe or lined channel so that the discharge does not cause erosion. Muddy water to be pumped from excavation and work areas must be held in settling basins or treated by filtration prior to its discharge. Waters must be discharged through a pipe or lined channel so that the discharge does not cause erosion and sedimentation;
- L. All control measures are inspected, and repaired as necessary. During prolonged precipitation, daily inspections and repairing must be performed. The permittee shall maintain records of such inspections and repairs. Routine facility inspections must be conducted at the following frequencies:
 - once every 14 calendar days; and
 - within 24 hours of the end of a storm event of 0.5 inches or greater; and
 - within 24 hours of a discharge generated by snow-melt.
- M. A specific individual is designated to be responsible for erosion and sediment controls on each site;
- N. There shall be no distinctly visible floating scum, oil or other matter contained in the stormwater discharge. The stormwater discharge must not cause an objectionable color contrast in the receiving water. The stormwater discharge must result in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life or fish and aquatic life in the receiving stream; and

- O. When the land disturbing activity is finished and stable, perennial vegetation has been established on all remaining exposed soil.
- P. Any person, business or entity that performs an activity which requires an OPDES/NPDES Stormwater Permit shall make available to the City copies of permits, applications and any other records or correspondence pertaining to the aforementioned permit. Any person, business or entity which discharges or causes to be discharged stormwater to the MS4 may be required to provide the City with copies of any records or correspondence determined to be necessary to ensure compliance with this ordinance.
- Q. The developer/property owner and contractor designated by the developer are responsible for implementation of, and compliance with, the Erosion and Sedimentation Control Plan, and maintenance of erosion control devices. The developer or the designated contractor must apply for the Earth Change Permit. If no contractor is designated, the contractor having day to day operational control of the site is considered to be designated by the developer.
- R. Commercial or residential construction sites less than one acre, but which are part of a common plan of development larger than one acre, such as individual residential lots in a subdivision, are required to maintain BMPs implemented during development. The BMPs may be modified or temporarily removed with approval of the City. If BMPs are absent or not effective, the property owner or designated contractor will, at a minimum, install BMPs to keep streets, drainage ways, and storm drains free from sediment or other construction material or debris.
- S. Earth Change Permit and Stormwater Inspection fees shall be assessed according to the City of Norman Standard Specifications and Construction Drawings.
- T. An Annual Renewal fee shall be paid per the schedule of fee.

6004.3 Best Management Practices (BMP)

The minimum standards for controlling erosion and sedimentation from earth disturbing activities shall be set forth in the Best Management Practices Manual, as adopted and amended from time to time by resolution approved by the city council.

6004.4 Termination Requirements

In the event that any person holding an Earth Change Permit violates the terms of the permit or this Section, the City may revoke or suspend the permit and require a stoppage of all work on site until all violations are corrected. Any person engaged in activities regulated by this Section without first obtaining the

required permit will be required to stop all work on site until a permit is obtained.

6005 INDUSTRIAL STORMWATER RUNOFF CONTROL

6005.1 Industrial Activities

All industrial activities shall be in compliance with and permitted under this Section and performed in such a manner as to minimize the discharge of pollutants into the MS4. All such activities are also subject to the requirements of the City of Norman Engineering Design Criteria and Standard Specifications and Construction Drawings as incorporated by reference in Section 16-101 of the City of Norman Code of Ordinances and may also be subject to the requirements of ODEQ's Multi-Sector General Permit for Stormwater Discharges from Industrial Activities Within the State of Oklahoma, OKR05, if the industrial activity is covered under SICs listed in the OKR05 permit. To seek coverage under OKR05, a NOI must be submitted to ODEQ.

6005.2 Permit Requirements

- A.** No industrial activity shall be conducted within the City except in such a manner that complies with the most current OKR05 permit. No Exposure Certificate
- B.** No Exposure Certificate
 - 1. Upon request for an NEC, an inspection of the facility may be performed by the Stormwater Division. Facilities that have been issued an NEC may be subject to an annual compliance inspection. If it is determined that the facility no longer qualifies for an NEC then an application for an industrial stormwater discharge permit must be submitted.
 - 2. A condition of no exposure exists at an industrial facility when all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products. Material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product or waste product. A storm resistant shelter is not required for the following industrial materials and activities:
 - a.** drums, barrels, tanks, and similar containers that are tightly sealed, provided those containers are not deteriorated and do not leak. "Sealed" means banded or otherwise secured and without operational taps or valves;
 - b.** adequately maintained vehicles used in material handling; and

- c. final products, other than products that would be mobilized in stormwater discharges (e.g., rock salt).
- 3. No Exposure Certification must be provided for each facility qualifying for the no exposure exclusion. In addition, the exclusion from NPDES permitting is available on a facility-wide basis only, not for individual.
- C. If an NEC is issued, the facility will be exempt from requirements of the industrial stormwater discharge permit for a period not to exceed twelve (12) months from date of issuance. A new NEC must be submitted annually no later than July 1.

6006 POST-CONSTRUCTION STORMWATER RUNOFF CONTROL

6006.1 Post-Construction Stormwater Runoff Control Measures

Post-construction stormwater runoff control measures includes those BMPs which are typically installed during, and left in place after the completion of, a construction project. This includes detention ponds, retention ponds, rain gardens, pervious pavement, and other controls, including those described in **Section 7000**:

6006.2 Operation and Maintenance Requirements

- A. For the purposes of this section, an “owner/operator” is defined as the party with control over operational and maintenance activities of the BMP, including home owner associations, commercial, and industrial entities.
- B. A maintenance plan shall be developed which defines who will conduct the maintenance, the type of maintenance necessary to ensure effective performance, and the maintenance intervals. At a minimum,
 - 1. The owner/operator shall inspect the BMP at least annually.
 - 2. The owner/operator shall maintain and repair the BMP:
 - a. In the case of basins and other facilities where sediment collects, to preserve the storage or capacity at or above the design volume or, where no design storage volume or capacity is incorporated into the permit, the volume or capacity recommended by the manufacturer.
 - b. In the case of conveyances and other structures, to preserve design hydraulic capacity.
 - c. In the case of facilities relying on soils and vegetation for stormwater management or treatment, to preserve healthy vegetation and design soil permeability.
 - d. In the case of all facilities, as necessary to preserve the integrity and intended function.
 - e. Any other additional requirements specified in **Section 7000**:

END OF SECTION 6000

7000: SUSTAINABLE STORMWATER DEVELOPMENT

7001 INTRODUCTION

7001.1 Background

Stormwater can have significant impact on the water quality of Norman's natural areas. To minimize the effect of non-point source pollutants in stormwater, stormwater control measures (SCMs, or controls; also referred to as "BMPs") are encouraged to reduce the impact of development. Controls are designed to improve water quality by removing suspended particulate matter and associated constituents such as bacteria, nutrients and metals.

SCMs are in line with sustainable design practice goals and complete streets principles. As stewards for the land, Norman encourages the use of SCMs on all developments, including new, existing, and redevelopment sites. Installing such controls are incentivized through coordination with the City but are also encouraged within the Lake Thunderbird Watershed as prescribed in the Water Quality Protection Zone (WQPZ) Ordinance.

The information in this section is intended to define the technical design criteria to be used in the design of SCMs. This document provides criteria for both the design of stormwater controls to enhance water quality and for the long-term maintenance of these facilities. The criteria should be followed to provide protection of the water resources in Norman and to minimize time and effort in obtaining project review and approval.

7001.2 Site Design Credits

RESERVED

7001.3 Sustainable Development Incentives

RESERVED

7002 GENERAL DESIGN CRITERIA

7002.1 Water Quality Volume

The primary control strategy for water quality basins is to capture a minimum volume of stormwater runoff for treatment and to release the treated volume in length of time specified. The minimum volume is the amount of runoff that is produced by the first one inch (1") of rainfall. This depth of runoff from the contributing drainage area to the control is and will be referred to as the Water Quality Volume or WQV. The WQV must be routed through the SCM as designed per this Section of the EDC.

- A. The water quality volume must consist of runoff from all impervious surfaces (existing and proposed conditions) such as roadways, parking

areas and roof tops, and all developed pervious areas. Water quality treatment is not required for runoff from lands left in their natural state, e.g., greenbelts and open spaces. Runoff from these areas must be routed around the water quality basin or it must be included in the water quality volume. Off-site contributing drainage should be routed around the water quality basin except in cases where untreated, off-site area can be treated.

B. Water Quality Volume Determination

$$WQV = \frac{D_s * R_v * A}{12} \quad (1)$$

$$R_v = 0.05 + 0.009I \quad (2)$$

Where,

WQV = Water Quality Volume (ft³)

D_s = Target precipitation depth (1.0 inch)

R_v = Volumetric runoff coefficient

I = Percent impervious cover

A = Site area (ft²)

7002.2 SCM Regulations

Stormwater control measures (SCMs) are engineered facilities designed to reduce and/or treat stormwater runoff, which mitigate the effects of increased stormwater runoff peak rate, volume, and velocity due to urbanization. **The following must be met as part of the incorporation of SCMs into a site.**

- A. SCMs must be registered with the City and dedicated within the plat
- B. Submit an operations and maintenance plan as required as part of the filed restrictive covenant

7002.3 Stormwater Controls Selection

Table 7002-1 below provides an overview of specific site conditions that must be met for a particular SCM to be suitable and other factors that go into SCM selection. SCM's are to be of the approved measures listed in the table unless otherwise approved by Public Works Director, or designee and designed based on adopted criteria from another public agency.

A. Type of Stormwater Control Measures

The SCMs are broken up into two general categories: small scale controls and large scale controls. Small scale controls are designed to be at the site scale where they are typically designed to treat runoff from one commercial building or residential parcel. Large scale controls are designed to be at the

watershed or neighborhood development scale where all runoff from the site is typically routed to one SCM per drainage area.

B. Pollutant Removal

The first set of columns reference water quality treatment and provide an overview of the pollutant removal performance of each SCM option when designed, constructed, and maintained according to the criteria and specifications in this Manual.

- **Total Suspended Solids (TSS) Removal** – Indicates the extent an SCM can remove total suspended solids from a water volume. If not removed, suspended solids will make a water body cloudy, clog fish gills, and reduce light penetration into the water which can damage stream health and aquatic life. Hotspots with significant loadings of suspended solids include areas such as roads, parking lots, and industrial sites or eroding channel banks.
- **Total Phosphorous (P) Removal** – Indicates the capability of an SCM to remove phosphorus in runoff. This may be of particular concern with certain downstream receiving waters due to eutrophication, a process where a body of water is supplied with an excess of nutrients. Excess nutrients can cause algal blooms which can disrupt an ecosystem and create hypoxic zones in the water. Sources of phosphorus include plant and leaf litter, pet waste, road salt, fertilizer, and soil particles. Hotspots for phosphorus are comprised of areas such as parks, lawns, roads, and agricultural sites.
- **Total Nitrogen (N) Removal** – Indicates the capability of an SCM to remove nitrogen in runoff, which may also be of particular concern with certain downstream receiving waters due to eutrophication— explained in the paragraph above. Sources and hotspots for nitrogen are the same as phosphorus.
- **Pathogen Removal** – Indicates the capability of an SCM to remove fecal coliform and associated bacteria in runoff. Removal of these contaminants are key to keeping waters sanitary. This capability may be of particular focus in areas with pathogen hotspots like public parks and/or water quality regulatory criteria under the Total Maximum Daily Load (TMDL) program.
- **Metals Removal** – Indicates the capability of an SCM to remove trace metals, which may be present in stormwater runoff from designated hotspots, or where subsurface soil and/or groundwater contamination may be present. Metals are generally hazardous, highly soluble in water, and can be absorbed by living organisms. If metals are allowed to enter the food chain, they can bioaccumulate in humans and cause serious health problems. Examples of hotspots for metals include: gas stations, convenience stores, public works storage areas, vehicle

service and maintenance areas, commercial nurseries, and auto recycling facilities.

C. Site Selection

The second group of columns provides an overview of specific site conditions or criteria that must be met for a particular SCM to be suitable. In some cases, these values are recommended values or limits that can be exceeded or reduced with proper design or depending on specific circumstances. Please see the specific criteria section of each practice for more details.

- **Maximum Contributing Drainage Area** – Indicates the approximate maximum drainage area that is considered suitable for the SCM. If the drainage area present at a site is slightly greater than the maximum allowable drainage area for a practice, some leeway can be permitted if more than one practice is installed. The minimum drainage areas indicated for ponds and basins should not be considered inflexible limits and may be increased or decreased depending on water availability (baseflow or groundwater), the mechanisms employed to prevent outlet clogging, and/or design variations used to maintain a permanent pool (e.g., liners).
- **Appropriate in Floodplain** – Indicates whether an SCM is allowed to be placed inside a floodplain.
- **Minimum Distance to Groundwater Table** – Indicates the minimum depth to the seasonally high-water table from the bottom, or floor, of an SCM.
- **Maximum Site Slope** – Evaluates the effect of slope on the SCM. Specifically, the slope restrictions refer to how flat the area where the SCM is installed must be and/or how steep the contributing drainage area or flow length can be.

D. Costs

The third group of columns provides comparisons between cost estimates and maintenance requirements between SCMs.

- **Construction Cost** – Structural controls are ranked according to their relative construction cost per impervious acre treated, as estimated from cost surveys.
- **Maintenance Cost** – Assesses the relative maintenance effort needed for an SCM in terms of three criteria: frequency of scheduled maintenance, chronic maintenance problems (such as clogging), and reported failure rates. It should be noted that stormwater control measures require routine inspection and maintenance, especially after a storm event.

E. Other

The last group of columns address safety issues and other benefits that a specific SCM has.

- Safety Issues – Safety considerations for each SCM. Either 'None' or a recommendation on the design that will decrease the likelihood of an accident.
- Benefits – Miscellaneous benefits that an SCM has. Benefits include but are not limited to items like aesthetic value, adaptability, and groundwater impacts.

7002.4 Pollutant Removal and Treatment Trains

Hydrologic studies show smaller, more frequent rain events account for the majority of rain events. The runoff from these smaller events account for a large portion of the annual pollutant loadings. By treating these frequent, smaller rain events and the initial portion of the stormwater runoff from larger events, it is possible to effectively mitigate the water quality impacts from a developed area. A 1.0 inch rainfall has been identified as a reasonable target for addressing the majority of smaller, pollutant-laden runoff events referred to as the WQV.

In accordance with the Section 19-411 of Chapter 19 of the Code of the City of Norman, the WQV within the Water Quality Protection Zone (WQPZ) must be treated to a 58% phosphorus and 75% nitrogen reduction. A stormwater management system designed to meet the requirements for treating the WQV will treat the first 1.0 inch of runoff, or less for smaller storms, to the 58% phosphorus and 75% nitrogen removal standards. The following section details the phosphorus removal calculations. The same process and equations should be used to calculate the percent removal of nitrogen.

A. Calculate Percent Phosphorus Removal

As stated previously, the engineer must utilize one or more treatment facilities to achieve or exceed the minimum 58% phosphorus removal in a WQPZ. **Table 7002-1** provides the percent phosphorus removal value provided by each of the SCM's presented in this Manual. If a single SCM is used for a site the percent phosphorus removal value from **Table 7002-1** applies and no further calculations are needed. If multiple SCM's are used at a site, the resulting overall removal rate should be calculated using one of the following methods. The method selection is determined based on the design of the SCMs and whether they have been placed in parallel, series, or a flow-through set-up.

1. Controls in Parallel

For controls placed in parallel the following equation shall be used:

$$P_{parallel} = \frac{\sum_1^n (P_1 A_1 + P_2 A_2 + \dots + P_n A_n)}{\sum_1^n (A_1 + A_2 + \dots + A_n)} \quad (3)$$

Where,

P_n = Phosphorus removal for each SCM on-site from **Table 7002-1** (%)

A_n = Area draining to each control (acre)

And any untreated area is to be assigned a null control with a phosphorus removal rate of 0%

a. Design Example

- A stormwater management system located on a 13 acre development site contains a treatment train that treats stormwater runoff from the site. Determine the phosphorus removal rate for site controls placed in parallel given the following information:
- Control A: Infiltration Trench treating 5 acres - 60% removal efficiency
- Control B: Wet Pond treating 4 acres - 55% removal efficiency
- Control C: Infiltration Trench treating 4 acres - 60% removal efficiency

$$P_{parallel} = \frac{\sum (60\% * 5 \text{ acre} + 55\% * 4 \text{ acre} + 60\% * 4 \text{ acre})}{\sum (5 \text{ acre} + 4 \text{ acre} + 4 \text{ acre})}$$

$$P_{parallel} = 58.5\%$$

- This exceeds the 58% phosphorus removal requirement. No further water quality control is required to meet the phosphorus removal requirements. The same steps should be followed to determine if the nitrogen removal requirements are met for the treatment train in parallel.

2. Controls in Series

For a site where two or more controls are implemented in series, where stormwater treated in one control is discharged directly into the next control for further treatment the following equation shall be used:

$$P_{series} = P_A + P_B - \frac{P_A * P_B}{100} \quad (4)$$

Where,

P_{series} = Total phosphorus removal for series (%)

P_A = % phosphorus removal for the first (upstream) control (%)

P_B = % phosphorus removal for the second (downstream) control (%)

For more than two controls in a series, P_A shall be the combined removal for the first two controls and the removal for the third control shall be P_B . Repeat this procedure as necessary to account for all controls in the series.

a. Design Example

- A stormwater management system located on a 13 acre development site contains a treatment train that treats stormwater runoff from the site. Determine the phosphorus removal rate for site controls placed in series given the following information:
- Control A: Permeable Pavement treating 5 acres - 50% removal efficiency
- Control B: Vegetated Filter Strip treating 1 acre - 20% removal efficiency
- Control C: Wet Pond treating 4 acres - 55% removal efficiency

$$P_{AB} = 50\% + 20\% - \frac{50\% * 20\%}{100}$$

$$P_{AB} = 60\%$$

$$P_{series} = P_B + P_C - \frac{P_{AB} * P_C}{100}$$

$$P_{series} = 60\% + 55\% - \frac{60\% * 55\%}{100}$$

$$P_{series} = 82\%$$

- This exceeds the 58% phosphorus removal requirement. No further water quality control is required to meet the phosphorus removal requirements. The same steps should be followed to determine if the nitrogen removal requirements are met for the treatment train in series.

3. Flow-Through Control

A flow-through scenario occurs when runoff to be treated enters the treatment train between two other controls located in series. In these cases the following equation shall be used:

$$P_{FT} = \frac{P_A A_A + P_B A_B + \frac{P_B A_B (100 - P_A)}{100}}{A_A + A_B} \quad (5)$$

a. Design Example

- A stormwater management system located on a 10 acre development site consists of a bioswale and a sedimentation basin. Four acres drain to the bioswale, which then drains to a pipe system. The pipe system drains an additional 6 acres that have not been treated for water quality. The pipe system leads to the sedimentation basin for final treatment. What is the resulting phosphorus removal efficiency if the bioswale and sedimentation basin both have a 50% phosphorus removal efficiency?

$$P_{FT} = \frac{50\% * 4 \text{ acre} + 50\% * 6 \text{ acre} + \frac{50\% * 4 \text{ acre}(100 - 50)}{100}}{4 \text{ acre} + 6 \text{ acre}}$$

$$P_{FT} = 60\%$$

- This exceeds the 58% phosphorus removal requirement. No further water quality control is required to meet the phosphorus removal requirements. The same steps should be followed to determine if the nitrogen removal requirements are met for the treatment train with a flow-through.

Table 7002-1: Stormwater Control Method Selection Guide Table

	SCM (Stormwater Control Measure)	Pollutant Removal					Site Selection				Costs		Other	
		TSS	Total P	Total N	Pathogens	Metals	Maximum Contributing Drainage Area	Appropriate in Floodplain	Minimum Distance to Groundwater Table	Max Site Slope	Construction Cost	Maintenance Cost	Safety Issues	Benefits
Small Scale	Vegetated Filter Strip	50%	20%	20%	60%	40%	5,000 square ft.	Yes	1-2 ft	0.5-6% (non-reinforced) or 6-15% (reinforced)	Low	Low	None	Adaptable to many site conditions
	Rainwater Harvesting	varies	varies	varies	varies	varies	House Roof-top	N/A	N/A	No Restriction	Medium	Medium	non-potable water without treatment	Water supply
	Rain Garden	85%	80%	60%	90%	95%	2 ac	No	1 ft	15%	Medium	Medium	Potential mosquito habitat if not maintained	Aesthetic, flexible geometry to fit any site
	Infiltration Trench	90%	60%	60%	100%	90%	5 ac	Yes	2 ft	6%	High	High	None	Recharge groundwater, preserve baseflow
	Green Roofs	80%	50%	50%	N/A	N/A	N/A	N/A	N/A	2%	High	Medium	None	Increased roof lifespan and insulation
	Permeable Materials	80%	50%	50%	N/A	60%	N/A	Yes	2 ft	5-10% (Grid Paver & Porous Asphalt) 6% (Pervious Concrete)	High	High	None	Reduces standing water on pavement Reduces impervious cover
	Bioswales	90%	50%	50%	N/A	40%	5 ac	Yes	Below-2 ft	4%	Medium	Low	Depth should be limited to 18 in	Slow & shallow flow, little erosion
Large Scale	Sedimentation / Filtration	80%	50%	30%	40%	50%	2-10 ac	No	2 ft	6%	High	High	Filters should be fenced in or locked to prevent access	Few site constraints
	Extended Detention Basin	60%	35%	25%	N/A	25%	10 ac	Yes	2 ft	15%	Low	Low	None	Simple retrofit to existing detention ponds
	Wet Ponds	80%	55%	30%	70%	50%	25 ac	No	2 ft	15%	High	High	Avoid steep slopes Avoid swimming and fishing	Can be designed and landscaped for aesthetic value Serves as a site amenity

*Infiltration practices not allowed for sites with hazardous material insitu soils

7002.5 Soil Infiltration

An evaluation of infiltration rate is necessary to determine if infiltration is feasible at a site where an infiltration based SCM is proposed and to establish design infiltration rates for SCMs.

There are three steps for evaluating the infiltration rate:

1. Desktop study: soil survey maps or existing geotechnical information
2. Field sampling: soil depth verification and textural analysis
3. In-situ testing: more rigorous in-situ infiltration or percolation testing

Design infiltration rate shall be established by applying a minimum safety factor of 2 to the estimated or measured infiltration rate. Porous pavement for pedestrian use only may be designed without additional field verification or sampling. Additional field sampling or testing is required for other infiltration-dependent controls. In-situ testing is allowed for all SCMs but only required for SCMs that use full or partial infiltration methods. For these cases, infiltration rate confirmation is required during construction to confirm design assumptions.

A. Desktop Study

1. Desktop resources such as soil survey maps, published reports, or other available data is appropriate for screening to assess the feasibility and desirability of infiltration.
2. The infiltration rate shall be derived from the hydraulic conductivity listed in the U.S. Department of Agriculture National Resources Conservation Service Soil Survey for the location and soil type reported for the site. Geotechnical data from previous site studies or nearby representative locations may also be used.
3. If a range of hydraulic conductivity values is available, the infiltration rate shall be estimated as the geometric mean.

B. Field Sampling

The purpose of field sampling is to evaluate the depth and texture of soil at the location of the proposed water quality control.

1. Field sampling activities must be conducted under the direction of a qualified professional.
2. Soil depth and texture within the proposed footprint of the control must be evaluated via test pits, probes, borings, or similar means at a minimum frequency of one test location per 500 square feet.

3. Soil samples must be collected and evaluated at a depth below the expected bottom of the infiltration SCM. The probe or hole must extend to the minimum soil depth required for the proposed control.
4. Soil texture of representative samples may be classified in the field or by laboratory methods such as sieve and hydrometer analysis.
5. Based on the soil texture in the field, a representative infiltration rate can be estimated from desktop resources. In the event that the soil textures in the field differ from published references, additional testing and analysis must be conducted to establish a representative infiltration rate.

C. In-situ Testing

1. More rigorous in-situ infiltration or percolation testing methods provide the most accurate estimate of the infiltration rate. Laboratory tests are not recommended because typical laboratory samples are less representative of field conditions. A variety of in-situ tests are available for measuring the infiltration capacity of the soil.
 - a. Test pit
 - b. Soil boring
 - c. Double-ring infiltrometer
 - d. Cased borehole infiltration test
 - e. Pilot infiltration test
 - f. Soil grain size analysis
 - g. Well permeameter method
2. In-situ testing must be conducted under the direction of a qualified professional.
3. Testing must be conducted within the proposed footprint at a minimum frequency of one test per 2,000 square feet, although a higher testing frequency is recommended to more fully characterize the subsurface conditions.
4. When more than one infiltration test is conducted for a single control, a representative infiltration rate must be calculated as the geometric mean of the test results.
5. The infiltration test should be conducted as close as possible to the proposed bottom elevation for the water quality control.
 - a. Based on observed field conditions, the designer may elect to modify the proposed bottom elevation of the control.
 - b. Personnel conducting infiltration tests should be prepared to adjust test locations and depths depending on observed conditions.
6. The designer should keep in mind the difference between percolation tests and infiltration tests when determining the design infiltration rate.

- a. A measured infiltration rate can be determined from a single or double ring infiltrometer test.
 - b. A percolation rate determined from the simple open pit percolation test is related to the infiltration rate but tends to overestimate infiltration rates due to both downward and horizontal movement of water.
 - c. Infiltration rates correspond only to the downward movement of water.
7. In addition to the percolation test methods discussed below, the following are acceptable methods for percolation testing:
- a. Single Ring Infiltrometer Test (ASTM D5126)
 - b. Double Ring Infiltrometer Test (ASTM D3385)
 - c. Guelph Permeameter
 - d. Constant Head Permeameter (Amoozemeter or USBR Procedure 7300-89)

D. Percolation Test Protocol

1. The percolation test is geared towards investigation of smaller infiltration facilities (drainage areas 2 acres or less and a maximum ponding depth of 12 inches).
2. The test can be conducted using simple tools and manual labor and does not require extensive excavation.
3. Test Preparation
 - a. The test hole opening shall be between 8 and 12 inches in diameter or between 7 and 11 inches on each side if square.
 - b. The bottom elevation of the test hole shall correspond to the bottom elevation of the proposed control (infiltration surface).
 - c. Place approximately 2 inches of gravel in the bottom of the hole to protect the soil from scouring.
 - d. If horizontal infiltration is to be allowed, the sides of the test hole shall be scarified.
 - e. Pre-soak the hole by carefully filling it with water. If the hole has not drained completely within 24 hours, then an infiltration design is not recommended.
 - f. Testing may commence after all of the water has percolated or after 15 hours has elapsed since initiating the pre-soak.
 - g. Testing must commence no later than 26 hours after all pre-soak water has percolated through the test hole.

- h. Place a bar over the top of the hole or a nail near the top of the hole to serve as a datum from which depth measurements will be made.
- i. Measure the depth and diameter of the test hole.

4. Test Procedure

- a. Carefully fill the hole with water to a level greater than or equal to the maximum ponding depth of the rain garden. Measure this water elevation and the time it was taken.
- b. Measure the water surface elevation as it drops and record the time of each measurement.
 - Measurements shall be taken with a precision of 0.25 inches or better.
 - Refill the hole as necessary to extend the test to at least 2 hours.
- c. The test can be terminated when near steady-state conditions (when the rate of drop is approximately constant) or when the test hole is empty.
- d. A general recommendation is to plan to take at least 4 measurements over at least 2 hours.
- e. Calculate the percolation rate using representative data points from the latter stages of testing where the rate of drop is approximately constant.
 - The percolation rate is the change in water elevation (in inches) by the corresponding time interval (in hours).
- f. Convert the steady-state percolation rate to a representative infiltration rate using the reduction factor:

$$I = \frac{p}{R_f} \quad (6)$$

Where,

I = Representative infiltration rate

p = Steady-state percolation rate

R_f = Reduction factor

And:

$$R_f = \frac{(2d_1 - \Delta d)}{D} + 1 \quad (7)$$

Where,

R_f = Reduction Factor

d_1 = Water depth at start of representative time interval (in)

Δd = Water level drop during representative time interval (in)

D = Diameter of percolation hole (in)

- g. The reduction factor accounts for the water losses through the sides of the percolation hole. It assumes the percolation rate is affected by the depth of water in the hole and the hole is located in uniform soil. If there are deviations from these assumptions, other adjustments may be necessary.

7002.6 Diversion Structures

- A. Off-line SCMs are required to have a diversion structure or splitter box which will capture the water quality volume. A typical approach for achieving capture of the water quality volume is to construct a diversion weir in the stormwater channel or storm drain. For SCMs that require a diversion structure the following minimum design standards must be provided:
 1. The height of the diversion weir must be equal to or greater than the surface elevation of the water quality volume in the SCM.
 2. The diversion structure must be capable of passing the peak flow rate of the twenty-five (25) year storm into the SCM
 3. The maximum velocity entering the SCM shall not exceed two (2) feet per second.
 4. When runoff in excess of the water quality volume enters the stormwater channel it will spill over the diversion weir. The diversion weir must be designed to pass the peak flow rate of the one hundred (100) year design storm past the SCM with a head over the diversion weir of no more than one foot.
 5. The SCM design shall allow enough freeboard to pass the design flow rate for the 100-year storm over the splitter/diversion structure without overtopping of any side walls of the pond, plus an additional 5% of the total fill height or three inches, whichever is greater, to allow for construction irregularities and long term soil settling.
 6. As an alternative, the professional engineer can size the diversion structure for the flow rate of the twenty-five (25) year inflow hydrograph that will fill the pond. A hydraulic and hydrologic analysis must be provided that conforms with the accepted procedures, as defined in **Section 5000**:
- B. SCMs may be allowed to stack the required detention volume or allow all storm events to flow through the SCM above the water quality volume. However, they can only account for volume that is available after 24-hour drawdown. These SCM are as follows:
 1. Partial sedimentation with sand filtration or biofiltration controls

2. Full sedimentation with sand filtration or biofiltration controls
 3. Extended detention basin with or without wet pond
 4. Rainwater Harvesting controls
 5. Rain Gardens
 6. Infiltration Trench
 7. Porous Pavement
- C. In-line SCMs that propose to stack the required detention volume or allow all storm events to flow through the SCM above the water quality volume must comply with the following criteria:
1. The velocity of the flows entering the SCM for the developed 100-year peak flow must not exceed two feet per second.
 2. Velocity breaks and energy dissipation should be incorporated into the design to reduce erosive impacts on the SCM and to protect the medium (sand or biofiltration) from washing out or eroding.
 3. Detention pond and SCM wall elevations must meet the minimum freeboard requirements provided in **Section 5000**.
- D. Maintenance Requirements
1. Remove all check boards at the end of the irrigation season to avoid damage to the structural works due to ice flows and large debris during high runoff times.
 2. Immediately repair any cracks or breaks in the concrete.
 3. Investigate cause before repair and take measures to prevent reoccurrence.
 4. Remove sediment, debris, or any blockage that restricts capacity.
 5. Remove woody vegetation and perennials from areas adjacent to the structural works.
 6. Repair spalls, cracks and weathered areas in concrete surfaces.
 7. Immediately repair any vandalism, vehicular or livestock damage.
 8. Eradicate or otherwise remove all rodents or burrowing animals.
 9. Immediately repair any damage caused by their activity.
 10. Do not operate motorized vehicles within six feet of structural works.
 11. Repair any gulling to earthen areas surrounding the structural works.

7002.7 Disconnection of Rooftop Runoff

Impervious surface disconnection involves the management of runoff near its source by capturing, filtering, treating, or reusing stormwater. Runoff from roofs that would have otherwise discharged to impervious surfaces is instead routed to pervious areas.

A. Design Criteria

1. Size of the receiving area must be at least the size of 10% of the contributing area.
2. Extend at least 2 feet from simple foundations and 6 feet from basements to minimize potential interaction.
3. Do not direct water to adjacent properties.
4. Runoff must be directed to an area with well-maintained vegetation.
5. The receiving area slope must be between 1% and 5%. Steep sloped areas should consider utilizing flow-dispersion techniques, such as a splash pad or level spreaders, at the outlet.

B. Construction Considerations

1. Downspout outlets that are already constructed to discharge at the ground surface should be modified to discharge to the receiving area using appropriate elbows and extensions as needed.
2. If connected directly to a standpipe at the base of the downspout, measure up from the standpipe approximately 9 inches and cut the downspout. Remember, it is better to remove too little than too much. Remove and discard the cut piece.
3. Secure the standpipe with a commercially available cap or plug. Do not use concrete to seal standpipe.
4. Attach elbow over downspout. Crimp inside of downspout if necessary to ensure a snug fit.
5. Measure and cut downspout extension to desired length. Again, secure the extension over the elbow to ensure proper fit to prevent leaks. Length of extension is dependent on the site.
6. Secure all pieces together at each joint with sheet metal screws.
7. Place splash pad or level spreader at extension discharge to encourage sheet flow of runoff, preventing erosion.

7002.8 Basin Liners

Impermeable liners are required for wet ponds and infiltration basins located in areas where there is a karst region or hazardous material conditions.

Impermeable liners may be clay, geosynthetic clay liner (GCL), geomembrane, or other approved liner, depending on the application. Concrete liners may be

used for sedimentation and filtration basins that are less than one thousand (1,000) square feet in area.

The analysis and design of the liner should entail a comprehensive review of the site-specific conditions to determine the most appropriate type of liner for the site and should include a stability assessment of the pond side slope. The criteria below is applicable to any size basin or pond. When required for sedimentation/filtration basins, the liner must underlie both the sedimentation basin and filtration basin and any separator wall areas.

Clay liners must comply with **Oklahoma Department of Environmental Quality 252:616-7-3** pre-construction and construction requirements. All liner must comply with the Liner **Specification 2106**.

A professional engineer must be involved in all aspects of the liner design. All liner studies, plans, details, specifications and other related documents must be sealed by a professional engineer. Careful attention must be paid to each of the following areas:

A. Liner Subgrade

A stable subgrade is very important in the construction of the pond or basin. Careful evaluation must be conducted to ensure the liner will be placed on a suitable base. If any voids are encountered, proper geotechnical analysis must be performed to ensure that the integrity of the liner can be maintained. Proof rolling must be conducted as necessary to determine the suitability of the subgrade, and any suspect areas must be reworked and recompacted, or the weak soils removed and replaced with suitable fill material. The subgrade for geomembrane or GCL must be smooth and contain no particles greater than 0.375 inch diameter.

B. Handling of Liner Penetrations

Detailed analysis must be performed related to the handling of all areas of liner penetrations such as pipe inlet and outlet structures, headwalls, and areas where concrete access ramps, maintenance and pump pads interface with the liner. Penetrations for wet ponds should be placed to minimize the hydraulic head over the penetration. Consideration must be given to the need for special applications such as filter diaphragms, gaskets, clay or bentonite plugs, special backfill and compaction, and other measures to prevent leakage around all these areas.

C. Submerged Inlets and Storm Sewers

Due to excessive leakage issues submerged inlets and storm sewers to SCMs are to be avoided whenever possible. In situations where site conditions require a submerged inlet or storm sewer, then the portion of the inlet pipe that is placed below the water quality elevation must be designed to store water, not simply convey it. In these situations, the pond liner must

extend and surround the portion of the inlet pipe or storm sewer that is designed to be under water and all structural elements and piping below the water quality elevation shall be watertight. Acceptable watertight piping includes gasketed RCP, PVC, and wastewater grade HDPE. Leak testing of the system will be performed to verify that the system is watertight and able to perform as designed.

D. Protecting the Liner from Erosion

The integrity of the liner, particularly a clay liner, can be severely compromised by any erosion that may occur at the surface of the liner. The design must provide appropriate mechanisms to prevent erosion of the liner at all areas, including the inlet structure and the separation berm between the forebay and main pool of wet ponds. Additionally, the liner must be continuous under wet pond separation berms to minimize the potential for leakage at the equalization/interbasin pipe.

E. Protecting the Liner Against Damage and Loss of Moisture

It is imperative that the clay liner be kept moist during construction and prior to the time the basin is filled.

F. Liner Plans and Specifications

The professional engineer must prepare the necessary plans and specifications to provide the contractor clear direction for the construction of the liner and all related components. Construction details must be included for all liner cross-sections, penetrations, and any other areas requiring special attention and/or guidance to ensure proper construction. A scale drawing of the area to be lined, including a grid established across the base and side slopes of the pond or basin with target elevations shown, must also be prepared by the professional engineer. This grid will provide a basis for verification of liner thickness during construction and will be used for the purpose of recording elevation data prior to placement of the initial lift and following placement of the final lift. All required testing, standards, procedures, and material properties must be spelled out in detail in the documents. Parties who are responsible for any surveying, sampling, testing and other verification requirements must be identified in the documents.

G. Groundwater Control

Liners constructed below groundwater will require dewatering as necessary to allow construction of the liner. To prevent damage to the liner due to uplift pressures after termination of dewatering or during future maintenance, the liner must include placement of sufficient soil ballast or additional thickness of clay liner to resist any uplift pressures. Alternative designs to relieve liner uplift pressure (French drain, etc.) will be considered and must be approved by the City.

H. Construction Quality Assurance/Quality Control Plan

A construction Quality Assurance/Quality Control (QA/QC) Plan must be prepared by the professional engineer for the purpose of providing a basis for all construction/installation and testing of the liner system during the liner construction process. The QA/QC plan must be approved by the City prior to liner construction.

I. Soils and Liner Evaluation Report (SLER), Geosynthetic Clay Liner Evaluation Report (GCLER), or Geomembrane Liner Evaluation Report (GLER)

All liner construction and QA/QC activities must be under the supervision of an independent licensed engineer with experience in geotechnical engineering. The engineer or designated representative must be on site during all significant liner construction activities, including but not limited to:

1. At the beginning of liner construction to inspect subgrade acceptability. Clay liners shall have an appropriate water content-density range to assure a maximum saturated hydraulic conductivity of 1×10^{-7} cm/sec, verified by an independent soil testing laboratory
2. During the processing of clay liner material for placement to ensure adequate moisture conditioning and particle size reduction.
3. During placement of clay liner lifts to ensure lifts are no more than nine inches thick uncompacted, and six inches thick compacted. Examine each lift before compaction and remove rocks, debris, or foreign matter greater than one inch in diameter. Also remove and repair lenses, cracks, channels and root holes that could adversely affect hydraulic conductivity.
4. During all geomembrane installation.
5. During clay and geomembrane liner testing.
6. Prior to placement of successive clay lifts to verify acceptability of prior lift surface.
7. During construction of penetrations and any other construction that will affect the integrity of the liner (access ramps, pump pads, etc.).
8. During placement of protective soil layer.

Following completion of the liner construction, SLER, GCLER, or GLER (as applicable for the type of liner installed) must be prepared under the direction of and sealed by the professional engineer and submitted to the City. The report is intended to provide documentation of all installation methods and testing procedures conducted during the installation of the liner and to provide evidence that the liner was constructed in accordance with the construction plans, technical specifications and QA/QC plan.

J. Water Level Monitoring for Liner Integrity Verification in Wet Ponds

After the filling and installation of aquatic vegetation in a wet pond, the

water level of the permanent pool shall be measured monitored for a minimum of eight weeks. The professional engineer shall specify the method and frequency of monitoring, and the responsible party for conducting water level monitoring. The professional engineer shall perform a water balance, as specified in **7004.3C.3**, to determine that the water loss does not exceed anticipated losses from calculated liner leakage, evaporation, plant transpiration and discharge. All monitoring data and calculations must be documented and submitted to the City of Norman for review.

7002.9 Short-Circuiting and Dead Storage

All water quality controls shall be designed to minimize short-circuiting (flow reaching the outlet structure before utilizing the entire water quality volume and/or surface area) and dead storage (areas within the basin which are bypassed by the flow regime and are, therefore, ineffective in the treatment process). Irregular shapes shall be avoided or shall use baffles or other measures to achieve adequate hydraulic efficiency. Inlet and outlet structures shall be located at extreme ends of the basin. Pilot channels are discouraged in water quality ponds due to the creation of short-circuiting and standing water problems.

For sedimentation basins, sediment chambers, and filtration basins, the inflow shall be discharged into the basin uniformly across the basin width. Ideally the inlet (diversion) structure should be designed to provide this uniform flow distribution. If not, a flow spreader is required in the basin to distribute flows.

See **Figure 7002-1** for preferred configurations for different SCMs (Note: Some figures are shown as rectangular shapes for simplicity; designs are not required to have straight edges).

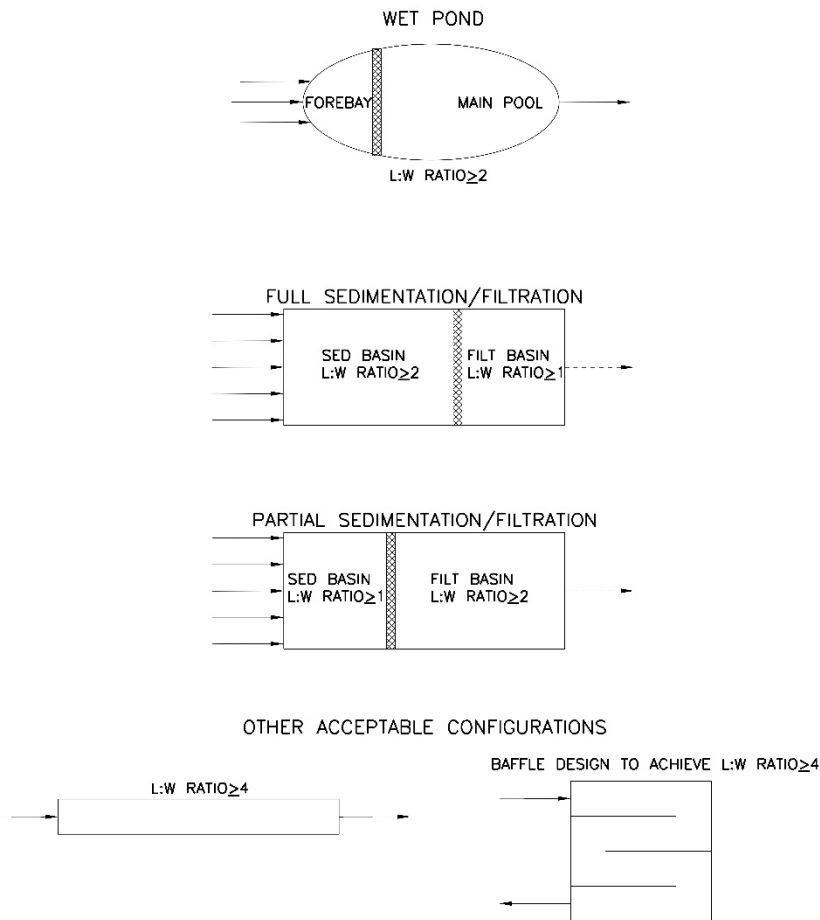


Figure 7002-1: Water Quality Control Configurations

7002.10 Integrated Pest Management Criteria

Integrated Pest Management (IPM) plans are required for all stormwater control measures outlined in this section except for permeable materials. The management of these SCMs must adhere to the techniques and control options described in this section and documented in an approved IPM plan. IPM is a continuous system of controlling pests (weeds, diseases, insects, or others) in which pests are identified, action thresholds are considered, all possible control options are evaluated, and selected control(s) are implemented. Control options which include biological, cultural, manual, mechanical and chemical methods are used to prevent or remedy unacceptable pest activity or damage. Choice of control option(s) is based on effectiveness, environmental impact, site characteristics, worker/public health and safety, and economics. The goal of an IPM system is to manage pests and the environment to balance benefits of control, costs, public health, and environmental quality. IPM takes advantage of all appropriate pest management options.

Manage the treatment system in conformance with the following criteria:

- A. **Applicability of Plan:** These performance requirements apply to the entire SCM, as well as areas immediately adjacent to and related to the facility (including access areas, easements, irrigation, and infiltration areas, etc.).
- B. **Vegetation Functions:** The vegetation in an SCM is integral and necessary for it to function properly. A minimum of 95% of the vegetation shall be alive and viable throughout the life of the system. No bare areas greater than 10 square feet may exist. These performance requirements apply to the entire SCM including the pond bottom, side slopes, and areas adjacent to the pond.
- C. **Mowing and/or Trimming:** Mowing and/or trimming of herbaceous vegetation shall occur with certain restrictions.
 - 1. **Tall and Medium Herbaceous Plants:** Trimming activities must not impinge on the growing tips (basal crown) of the bunchgrasses. Cutting these grasses below the basal crown will severely stress and possibly kill them. These plants shall be cut no lower than 18" from the ground. In all cases, clippings and trimmings shall be bagged and removed from the site.
 - 2. **Turf and other Short Herbaceous Plants:** Sod-forming grasses may be mown or trimmed to an appropriate height. These plants shall not be scalped; cut no lower than four (4) inches from the ground. All clippings and trimmings shall be bagged and removed from the site.
- D. **Weed Management:** A weed is generally defined as any plant in the wrong place. Refer to the original design and construction documents when uncertainty exists as to the appropriateness of a specific plant. Preventing the introduction of weeds is the most practical and cost-effective method for their management. Avoid bare soil by minimizing soil disturbance and properly managing desirable vegetation. Remove weeds early in their growth stage; before they set seed. Allow the desired vegetation to out-compete the weeds. It is necessary to allocate greater resources on landscape maintenance during the initial 3-year establishment period. During this time weed "pressure" from the drainage area will be greatest, as will availability of bare surface areas within the treatment system. These factors allow weeds to gain a foothold, especially during the first few months of the life of the SCM.
 - 1. **Cultivation:** May be done with hand tools; using cultivating machines is not acceptable. Cultivation can be repeated at 2-3 week intervals during the growing season. Any bare areas must be re-seeded.
 - 2. **Biofiltration and Rain Garden SCMs:** Mulching to control weeds by blocking light and air space is acceptable.
 - a. Wood mulch, the traditional material for minimizing weeds in ornamental landscapes, is not recommended because it will tend to

float or otherwise be washed out of the system. The innovative use of non-traditional mulches will be required when ornamental beds are used in biofiltration facilities. Gravel is permitted to cover the soil surface both in the sediment basin and the filter basin.

- b. Gravel or crushed recycled glass equivalent in size to gravel may be used to cover the soil surface in biofiltration.
 - c. Weed fabric is not permitted in biofiltration due to the potential for clogging of the pores.
- E. **Pesticides (includes herbicides) and Fertilizer:** The use of landscape chemicals, including fertilizer and pesticides, are not allowed within the treatment system without the approval of the City. Reference the Oklahoma Department of Agriculture, Food, and Forestry (ODAFF) Oklahoma Combined Pesticide Law & Rules
- F. **Invasive or Noxious plants:** Plant species that are invasive or noxious should not be planted or grown naturally in SCMs or their associated areas.
- G. **Mosquito Management:** SCMs shall not be a breeding place for mosquitoes. Incidental standing water must not be present for longer than four days (96 hours). If water exists for periods longer than this, the party responsible for maintenance shall remove the water from the SCM and conduct any repairs or design flaws to ensure that this condition is not repeated.
- H. **Wildlife and Pet Management:** In addition to water quality treatment, SCMs offer environmental benefits such as providing food and habitat for wildlife. Pets may also be attracted to them. Digging or burrowing by animals is particularly troublesome. Activities by animals within the SCM should be discouraged so to not interfere with its functions and design objectives. Where on-going problems with wildlife exist, fencing or similar exclusionary methods shall be implemented.
- I. **Irrigation System Performance:** Not all water quality treatment facilities include an irrigation system. When an irrigation system exists, evaluate the efficiency of the system on a periodic basis, especially at the beginning of each irrigation season. The evaluation shall identify problems with the system and ensure that problems are properly addressed.
- J. **Erosion:** Erosion damage to the treatment system shall be repaired immediately. Determine the cause of the erosion and address the situation to prevent it from recurring.
- K. **Restrictive Covenant:** A restrictive covenant is required to be filed. The restrictive covenant is the legal document requiring the use of IPM on a given site.

7003 SMALL SCALE CONTROLS

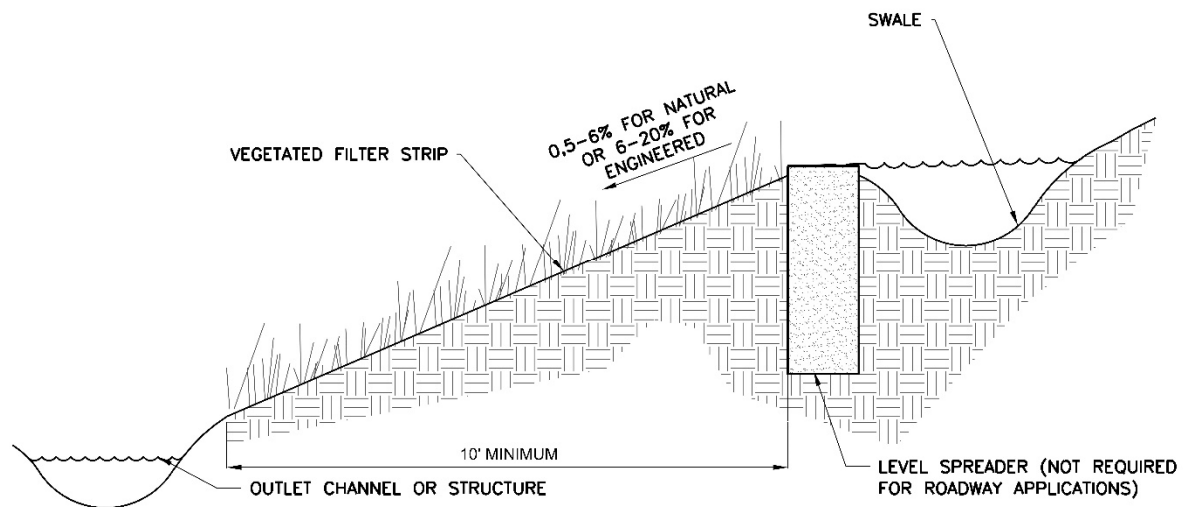
Small scale controls are designed to be at the site scale where they are typically designed to treat runoff from one commercial building or residential parcel. These SCMs generally have a contributing drainage area of less than 10 acres.

7003.1 Vegetated Filter Strip

A. Introduction

Vegetated Filter Strips (VFS) are a stormwater pre-treatment practice consisting of a densely vegetated area between a nonpoint source pollution source and a receiving body of water or stormwater conveyance system. This helps reduce the pollutant loading and stormwater volume entering the receiving body of water. They are commonly implemented next to impervious sites such as parking lots and roadways. Stormwater enters the strip as sheet flow, and as the velocity decreases the suspended sediment and pollutants can settle and/or be filtered by the dense vegetation.

An engineered level spreader should be incorporated where sheet flow cannot be attained naturally due to topography or pipes and channels to ensure sheet flow is achieved over the VFS. Depending on site characteristics and soil conditions, it is possible for infiltration to occur and



result in a minor reduction in runoff volumes. See **Figure 7003-1** below for a diagram of a vegetated filter strip utilizing a level spreader.

Figure 7003-1: Vegetative Filter Strip with Level Spreader

B. Design Criteria

1. Contributing Drainage Area

- a. Maximum 2 acres of drainage area.
- b. Receiving area shall be no smaller than 10% of the contributing imperious area.

2. Flow Path

- a. Flow path for impervious contributing drainage area shall be less than 75 feet in length.
- b. Flow path for pervious contributing drainage area shall be less than 150 feet in length.
- c. The predominant flow path between the end of the impervious contributing area adjacent to the VFS and the receiving body of water shall be at least 10 feet in length.

3. Length of vegetative filter strip in the direction of flow should equal 0.2 times the longest length of the contributing area as defined below.

$$L_{fs} \geq 0.2 * L_a \quad (8)$$

Where,

L_{fs} = Length of vegetated filter strip in direction of flow

L_a = Longest length of contributing area

4. Landscape

- a. VFS shall have a minimum overall depth of 12 inches, with at least 6 inches of topsoil at the surface and 6 inches of native or fill soil below it.
- b. The condition, type, structure, and quality of soil shall be conducive to infiltration and plant growth. Soil amendments might be warranted.
- c. Turfgrasses shall be a minimum of three (3) inches in height and bunchgrasses a minimum of eighteen (18) inches in height.
- d. Filter strip should have a minimum of 95% vegetative cover.
 - Where 95% vegetative cover cannot be achieved a minimum of 4 inches of leaf litter, mulch, or other organic matter must be placed.
 - Existing vegetation can be used as filter strips if all other design criteria are met.

5. Slope of VFS

- a. Slope shall be within the range of 0.5-6% for non-reinforced/natural vegetative filter strip.

- b. Slope shall be within the range of 6-20% for reinforced/engineered vegetated filter strip.
- c. Velocity of flow shall not exceed 4 feet per second.

6. Soil conditions

- a. Soil characteristics shall be evaluated using the techniques described in **Section 7002.3**.
- b. Soils draining at less than 1 inch per hour shall require an underdrain or additional surface drainage.

7. Bottom of VFS shall be at least 1 foot above the seasonal high water table elevation.

8. Level Spreader

- a. If a level spreader is implemented, it shall create a vertical drop of at least 3 inches, but no greater than 12 inches, between the contributing area and the receiving area.
- b. Level spreaders or other measures for preventing flow from becoming concentrated should be spaced throughout the length of the filter strip at intervals of no more than 25 feet.
- c. A layer of geotextile should be extended a distance of 3 feet from the level spreader lip towards the filter strip. Stone, such as ASTM No. 57 aggregate, should be placed on top of the geotextile (3 to 4 inches deep) to reduce erosion just downslope of the level spreader.
- d. Acceptable materials for construction of level spreader:
 - Concrete
 - Quarried rock
 - Earthen material (soil, clay, etc.)
 - Aggregate mix of gravel and concrete

C. Construction and Maintenance Requirements

1. Construction

- a. VFS shall not receive runoff until after the contributing drainage area has been stabilized to prevent erosion and sedimentation.
- b. Review design with contractor in the field.
- c. Restrict and/or limit vehicular and foot traffic around SCM.
- d. Install as close to the end of construction as possible.
- e. Off-line construction is preferred.
- f. Keep sediment out of the SCM as much as practical.
- g. Clearly mark infiltration areas before work begins to avoid soil

compaction or sedimentation to preserve infiltration capacity.

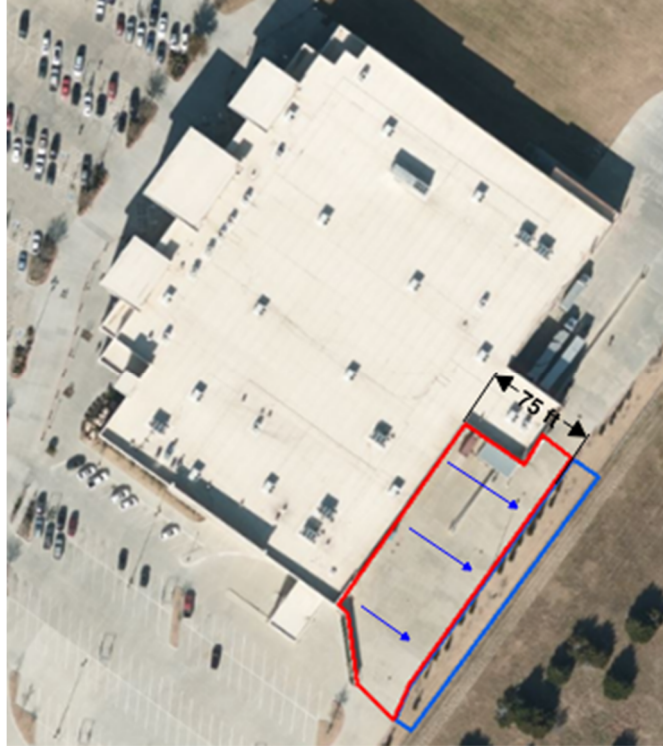
- h. Scarify subgrade before installing fill to loosen up native soil to promote infiltration.
- i. Specify construction sequence in construction docs.

2. Maintenance

- a. Inspection shall take place after the expected drawdown period.
- b. Debris and trash shall be removed from the filter strip and level spreader.
- c. Accumulated sediment shall be inspected and removed from the filter strip and level spreader.
- d. Grass shall be mowed regularly to maintain a dense vegetative cover.
- e. Grass shall be maintained at a height of 3-12 inches.
- f. Vegetation shall be inspected for rills and gullies.
- g. Bare areas shall be seeded and sodded as needed to maintain the minimum 95% vegetative cover.

D. Design Example

A portion of the parking lot of a commercial site (outlined in red below) will be treated with a vegetated filter strip (outlined in blue below). The area of the parking lot to be treated is 18,295 square feet and the length of the longest flow path to the vegetated filter strip is 75-feet. The soil infiltration rate was measured to be greater than 1 in/hr so no underdrain will be required. What is the minimum length of the vegetated filter strip in the direction of flow?



The minimum length of vegetated filter strip required to treat this area based on **Equation 8** is:

$$L_{fs} \geq 0.2 * 75 \text{ ft}$$

$$L_{fs} \geq 15 \text{ ft}$$

Minimum proposed filter strip width = 15 ft

7003.2 Rainwater Harvesting

A. Introduction

Rainwater harvesting is a way of intercepting, diverting, and storing stormwater runoff for later use. In a typical rainwater harvesting system, rainfall is collected from a gutter and downspout system, screened, and conveyed into an above- or below-ground storage tank. Please note that barrels, tanks, and cisterns can be used interchangeably but will be referred to as storage tanks in this criterion. Once captured, stored water may be used for non-potable indoor or outdoor uses. A diagram of a simple, above ground, residential rainwater harvesting system is shown in **Figure 7003-2** below.

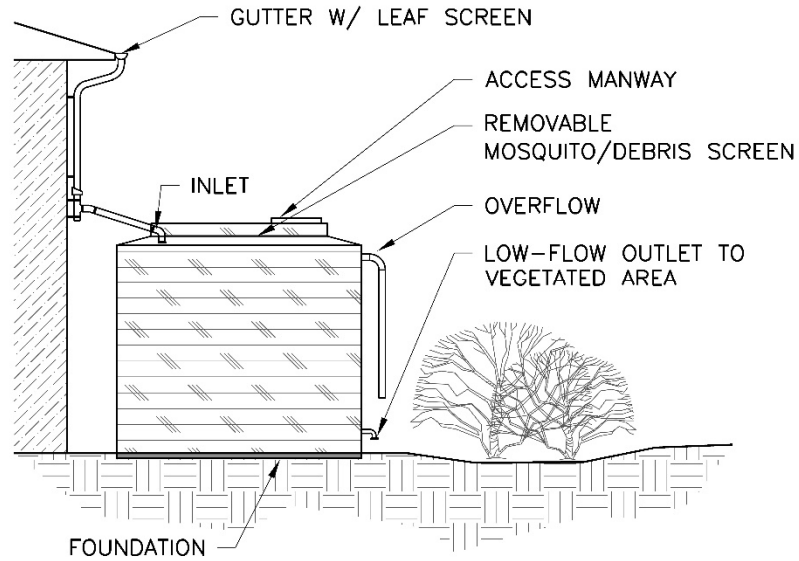


Figure 7003-2: Rainwater Harvesting System Diagram

B. General and Residential Design Criteria

Storage tanks are typically used to provide storage of rooftop runoff for small-scale residential applications. These systems are generally designed for outdoor, above ground use.

1. Rainwater Collection

- a. Rainwater shall be collected only from impervious areas such as rooftops.
- b. The rainwater harvesting system shall be designed to hold captured runoff for at least 12 hours after rainfall has ceased.
- c. The maximum drawdown time is 120 hours and can be calculated as follows:

$$DDT = \frac{WQV}{Q_{rwh}} \quad (9)$$

Where,

DDT = Drawdown time

WQV = Water quality volume

Q_{rwh} = Rate of discharge from the rainwater harvesting system

- d. Roof Surface

- The roof surface may be constructed of any material accepted by the city.
- The roof surface shall be accessible, maintained clean and free from debris.

The catchment area shall be based upon the footprint of the roof, not the actual area of the roof surface-based on the outside dimension of the roof. See **Figure 7003-3** below.

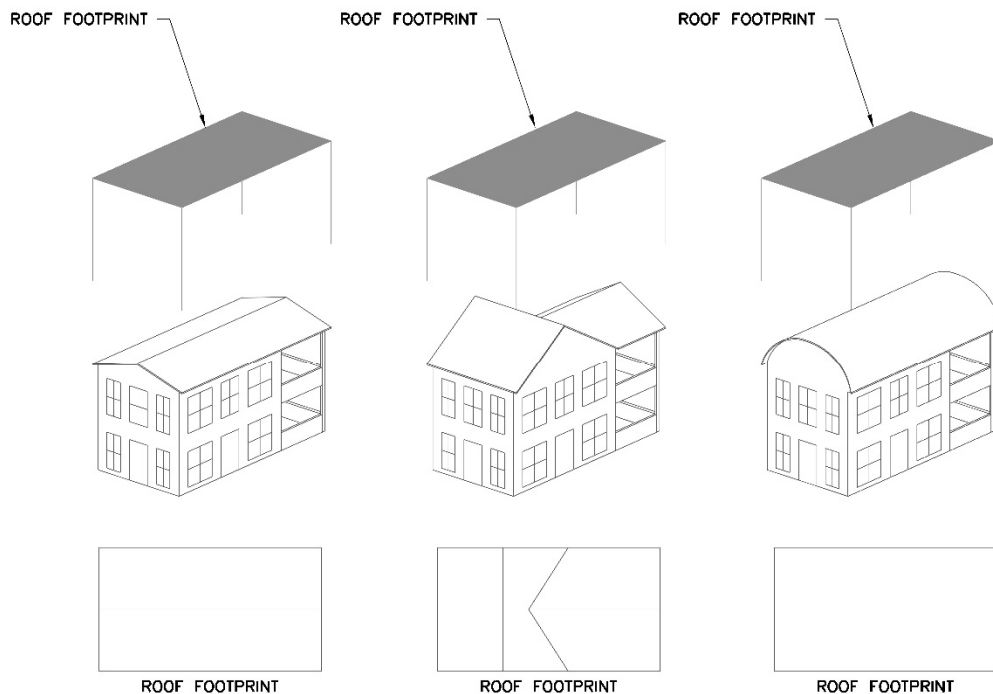


Figure 7003-3: Catchment Area Footprint

- The Catchment surface area can be determined using the following calculation:

$$A_c = LW \quad (10)$$

Where,

A_c = Catchment Area

L = Length

W = Width

- Catchment surface area harvesting efficiency
- The relationship between the actual quantity of water that runs off the surface compared to the total amount that falls on the surface. See **Table 7003-1** below for a table of catchment water efficiencies. These efficiencies should be used when sizing the rainwater harvesting system.

Table 7003-1: Capture Water Efficiencies

Catchment type	Simulated Rainfall Intensity (in/hr)	Theoretical Harvesting Efficiency (Farreny et al. 2011)	Average Measured Harvesting Efficiency (Ley et al. 2014)
Asphalt Shingle	2.5	0.90	0.80
Metal		0.92	0.87
Clay Tile		0.84	0.68
Asphalt Shingle	1.5	0.90	0.75
Metal		0.92	0.77
Clay Tile		0.84	0.66
Asphalt Shingle	1.1	0.90	0.79
Metal		0.92	0.81
Clay Tile		0.84	0.77

2. Gutters

- a. Gutters shall be continuous or seamless and constructed of materials approved for their intended use.
- b. Gutter outlets should be connected indirectly to the downspout with a screened leaf-protected receptor inlet.
- c. Gutters should be sized with slopes specified to contain the 1-inch storm at a rate of 1-inch/hour.
- d. Gutters should be hung at a minimum of 0.5% slope for 2/3 of the length and 1% slope for the remaining 1/3 length.

3. Downspouts

- a. Downspouts shall be continuously graded from the roof to the tank with a minimum slope of $\frac{1}{4}$ inch per 1 foot. No portion of the downspout shall be installed in a manner which will hold water.
- b. Downspouts shall be placed at a rate of 1 per 50 feet of gutter length.
- c. There shall be 1 square inch of downspout area per 100 square feet of roof area.

4. Pre-Screening

- a. Inflow must be prescreened to remove leaves, sediment, and other debris.
- b. Leaf screens and gutter guards are the minimum filtration requirement for small systems.
- c. Screens should be used on gutters, inlets, and outlets to limit debris from entering the tank.
- d. A non-corrodible screen with #24 mesh will prevent mosquito passage and be sturdy enough to keep animals out.

5. Storage Tank

- a. Adequate access for cleaning and maintenance purposes shall be provided.
- b. Storage tanks which have been previously used for other purposes are prohibited.

- c. Tanks shall be opaque or painted to prohibit algae growth and protected from direct sunlight.
- d. Screening for the tank may be required as per CCFBC and LDC/Zoning.
- e. Cover provided by trees or other vegetation shall not constitute acceptable protection from sunlight.
- f. Polypropylene tanks shall not be painted.
- g. Tanks shall be watertight and designed to withstand the structural loads required for their size and shape.
- h. Tank outlets shall be located at least 12 inches above the bottom of the tank.
- i. Tank shall be sited up-gradient of the drainage areas or on a raised stand.

6. Overflow Pipe

- a. The storage tank shall be equipped with an overflow device.
- b. The device shall be located within 2 inches of the top of the tank.
- c. The overflow pipe shall have a capacity equal to or greater than the inflow pipe and have a diameter and slope sufficient to drain the tank while maintaining the required freeboard.
- d. The overflow pipe shall not connect to any sanitary sewer.
- e. The overflow pipe should be directed away from buildings to prevent damage to building foundations.

C. Commercial and Industrial Specific Design Criteria

Larger storage tanks are used in commercial and industrial applications. These systems can use the harvested rainwater for non-potable applications such as flushing toilets or landscape irrigation. This requires additional plumbing, pressure tanks, pumps, and backflow preventers for the system.

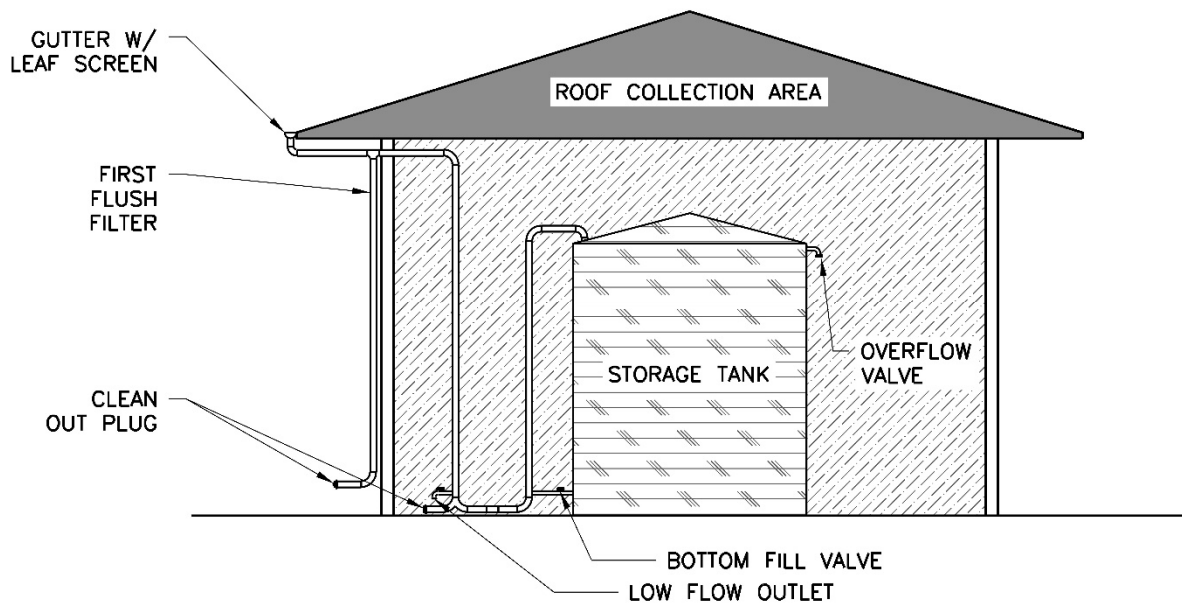


Figure 7003-4: Comm. Rainwater Harvesting System w/ Above Ground Tank

1. Gutters: In addition to the residential gutter requirements, the following should also be met:
 - a. Plastic materials shall be protected from ultra-violet (UV) radiation by factory applied protective coating or painted with a compatible latex paint.
 - b. Piping and solvent creams shall be approved for the intended use.
 - c. Metal materials shall be seamless aluminum, galvanized steel or other approved material.
 - d. All gutters leading to the tank shall be fitted with leaf screens the entire length of the gutter including the downspout opening.
 - e. Leaf screen openings shall be no larger than 0.5 inches.
 - f. Gutters shall have a continuous grade with a minimum slope of 1/16 inch per 1 foot to the outlet leader with no sags or flat portions where water will collect or stand.
 - g. Gutter hangings shall be present every 3 feet.

2. Roof Washer

Commercial or industrial rainwater harvesting systems using impervious roof surfaces shall have at least one roof washer. A roof washer is not required for pervious roof surfaces such as green roofs.

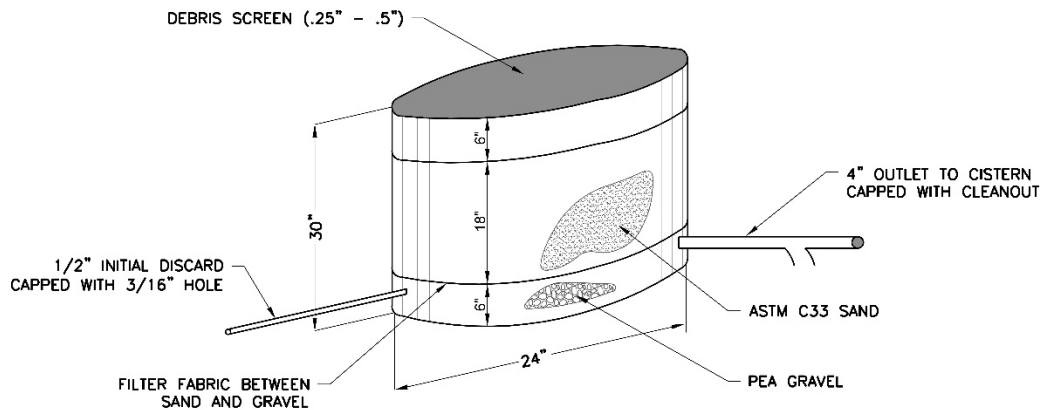


Figure 7003-5: Roof Washer Detail

- a. All collected rainwater shall pass through a roof washer before the water enters the storage tank(s).
- b. If more than one storage tank is used, a roof washer shall be used for each.
- c. Roof washers shall be listed factory assemblies or constructed of approved materials on site.
- d. The inlet to the roof washer shall be provided with a corrosion resistant debris screen with openings no larger than 1/16" to protect the roof washer from waste, animals, and mosquito breeding.
- e. The roof washer shall have minimum dimensions of 30 inches tall and be 24 inches in diameter or 24 inches square. The roof washer shall contain 6 inches of pea gravel. The entire surface of the gravel shall be covered with geotextile (LINQ 125EX; LINQ TYPAR3201; TNS E040; TNS R040; AMOCO 4535; Marafi 140NL or approved equal).
- f. The geotextile shall be topped with 18 inches of sand conforming to OAR 340-71- 295 (3) (e) or silica sand meeting either NSF/ANSI 61 or AWWA B100-53, Section A 2.4.
- g. The outlet for the initial rainfall discharge shall be located in the side of the roof washer at or near the bottom. The outlet pipe shall be 0.5 inches nominal, capped with a 3/16 inch drain hole.
- h. The outlet pipe to the storage tank shall be located in the pea gravel layer of the roof washer. The pipe shall be 4 inch nominal and fitted with an approved clean-out fitting. Access to the clean-out fitting shall be provided.
- i. The outlet pipe entering the storage tank shall terminate in a return elbow a minimum of 12 inches above the tank bottom.

- j. Roof washers shall have a cleanout fitting in the bottom of the device.
- k. Roof washers shall have an automatic means of self-draining between rain events.
- l. Roof washers shall be accessible for maintenance and service.

3. First Flush Diverter

- a. For commercial and industrial systems, the first flush of rooftop runoff should be diverted to a secondary treatment practice (such as any of the small scale controls included in **Section 7003**) to prevent sediment from entering the system.
- b. First flush diverter shall be designed to capture the first 1 gallon per 100 square feet of catchment area.
- c. When runoff enters a storage tank through roof leaders it must pass through a first flush diverter that is self-draining with a cleanout.
- d. Capacity relationship between PVC pipe diameter and length per gallon:

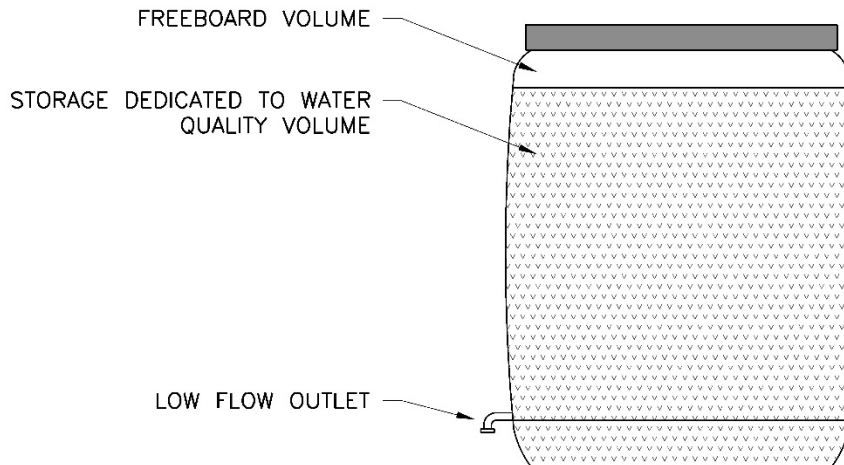
Table 7003-2: First Flush Diverter Sizing

PVC Pipe Diameter Schedule 40 (inches)	Chamber Length (inches/gallon) (capacity)
3	32.8
4	18.5
6	8.25
8	4.63

- a. First Flush Volume

$$Vol_{ff} = A_c \left(\frac{1 \text{ gal}}{100 \text{ ft}^2} \right) \quad (11)$$

4. Storage Tank



- a. The minimum internal height and width of a vault or tank shall be 3 feet.
- b. The maximum water surface elevation must maintain a minimum 1 foot of freeboard in a catchment basin below the catch basin grate.
- c. For tanks exerting less than 2,000 pounds per square foot: the foundation shall consist of at least 6 inches of No. 57 gravel or concrete.
- d. For tanks exerting greater than 2,000 pounds per square foot: the foundation shall consist of concrete.
- e. For tanks larger than 10,000 gallons the foundation shall consist of reinforced concrete.
- f. Below grade tanks shall have manhole risers a minimum of 8 inches above the surrounding grade.
- g. Below grade tanks made of plastic shall be reinforced and able to withstand the weight of the surrounding fill and soil and full capacity of water.
- h. Below grade tanks to be used year-round shall be constructed below the frost line or inside a structure to prevent freezing.
- i. A storage tank can be sized to account for additional volume to irrigate all or a portion of the property following the equations below:

- Storage volume for irrigation -

$$Vol_{other} = 0.6209I_{deficit}A_{irr} \quad (12)$$

Where,

Vol_{other} = Volume needed for irrigation (gal)

I_{deficit} = Irrigation depth needed for the month with the greatest deficit (in) according to the Oklahoma Mesonet Irrigation planner, 0.97 mean inches for the month of August

A_{irr} = Area of lawn to be irrigated (ft²)

0.6209 = Conversion factor between gallons and ft²in

- Total tank storage volume required -

$$Vol_{\text{STORAGE}} = WQV + Vol_{\text{other}} - Vol_{\text{ff}} \quad (13)$$

Where,

WQV = Water Quality Volume (gal)

Vol_{other} = Storage volume reserved for reuse (gal)

Vol_{ff} = First flush volume (gal)

5. Overflow Pipe

- The overflow device shall consist of a pipe at least equal in size to the inlet pipe, but no less than 4 inches in diameter.

6. Distribution System with Pump

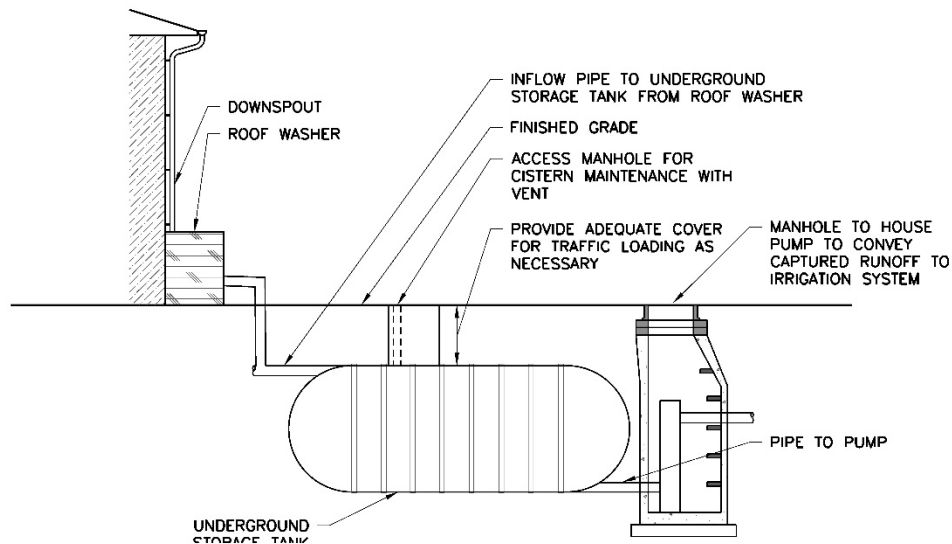


Figure 7003-6: Underground Storage Tank with Pump

- The pump shall be capable of delivering a minimum of 15 psi residual pressure at the highest outlet served.
- Minimum pump pressure shall allow for friction and other pressure losses.
- Maximum pressure shall not exceed 80 psi.

- d. Pressure tanks shall be of the expandable diaphragm type and sized based upon the peak flow capacity of the pump.
- e. Pressure tanks shall be sized based upon the demand required for the intended use.
- f. Pumps shall be a minimum of horsepower or as specified by the manufacturer.
- g. A full-size check valve shall be installed between the storage tank and the pump inlet.
- h. Pump inlet piping shall be a minimum of one $\frac{3}{4}$ inch or as specified by the manufacturer.
- i. On-demand pump systems, which incorporate the pump, motor, controller, check valve, and pressure tank may be used.
- j. Water intake supply from storage tanks to pumps shall be from a floating submerged intake pipe or equivalent.
- k. Pumps shall be at an elevation as close to practical as the elevation of the tank.
- l. Pumps shall be in a location which is protected from freezing, overheating or from other damage.

7. Piping

- a. Piping for rainwater harvesting systems shall be separate from any domestic potable piping system.
- b. There shall be no direct connection of any rainwater harvesting pipe system and any domestic potable water pipe system.
- c. Pipe used to convey harvested rainwater shall be:
 - Purple in color and shall conform to AWWA C901 for piping smaller than 4" diameter or AWWA C900, DR18 minimum for piping 4" diameter and larger; OR
 - Meet the requirements for potable water distribution pipe and be continuously wrapped with purple mylar tape meeting the following requirements:
 - Minimum nominal thickness of .0005 inches
 - minimum width of 2 inches.
 - made of PVC with a synthetic rubber adhesive.
 - have a clear polypropylene protective coating.
 - include the wording, "CAUTION: RECLAIMED WATER, DO NOT DRINK" every four feet along its length, but in no case less than once per room.
 - The lettering shall be black against a purple background.

- Fittings and other system components shall be listed for use in conjunction with specified piping.
 - Both piping and fittings shall be installed as required by applicable code and standards.
- d. Every water closet or urinal supply, hose bibb, irrigation outlet, or other fixture shall be permanently identified with an indelibly marked placard stating: "CAUTION: RECLAIMED WATER, DO NOT DRINK".
 - e. Where rainwater harvesting pipe and potable water pipe are installed in the same trench, wall cavity or other location, the potable water pipe shall be separated by a minimum distance of twelve inches above and away from the rainwater harvesting pipe.

8. Outfall Flow Control Structure

- a. Weir and orifice structures must be enclosed in a catch basin, manhole, or vault and must be accessible for maintenance.
- b. The control structure must be designed to pass the 100-year storm event as overflow, without causing flooding of the contributing drainage area.
- c. Orifices must be protected within a manhole structure or by a minimum 18-inch-thick layer of 1½ - 3-inch evenly graded, washed rock.
- d. Orifice holes must be externally protected by stainless steel or galvanized wire screen (hardware cloth) with a mesh of ¾ inch or less.
- e. Orifice diameter must be greater than or equal to the thickness of the orifice plate.
- f. Orifices less than 3 inches must not be made of concrete.
- g. A thin material (e.g., stainless steel, HDPE, or PVC) must be used to make the orifice plate.
- h. The plate must be attached to the concrete or structure.
- i. The minimum allowable diameter for an orifice used to control flows in a public facility is 2 inches.
- j. Private facilities may use a 1-inch-diameter orifice if additional clogging prevention measures are implemented.
- k. Orifice Equations

$$Q = CA\sqrt{2gh} \quad (14)$$

Where:

Q=Orifice discharge rate (cfs)

C=Coefficient of discharge (feet), value=0.6 for plate orifices

A=Area of orifice (square feet)

h=hydraulic head (ft)

g=32.2 ft/s²

9. Harvested rainwater can be gravity-drained to a vegetated area large enough to infiltrate all the water or used to irrigate the vegetated area.

- a. The infiltration rate of the soil is listed in the U.S. Department of Agriculture National Resources Conservation Service (NRCS) Soil Survey for the county, location, and soil type present at the irrigation site. If a range is given the lower value of the range shall be used.
- b. The design irrigation rate is not to exceed 0.20 inches/hour even if the NRCS value exceeds this rate.
- c. Irrigation must not occur on land with slopes greater than 10%.

D. Construction and Maintenance Requirements

1. Construction

- a. The roof, gutters, and downspouts shall be cleaned prior to installing the tank.
- b. Leaf screens shall be installed prior to the tank installation.
- c. Stormwater shall not be diverted to the rainwater harvesting system until the overflow path has been stabilized with vegetation.
- d. Manufacturer instructions shall be followed for the installation of the tank.

2. Maintenance

- a. Annual
 - Check system for sediment.
 - Clean out tank when sediment volume becomes greater than 5% of the volume.
- b. Semi-annually in spring and fall
 - Clean storage tank screens.
 - Inspect pretreatment devices for sediment accumulation. Remove accumulated trash and debris.
 - Inspect for tight connection at inlet and drain valve.
 - Check pumping system (if applicable) to ensure it is working properly.
 - Keep pipe clear of obstructions.

- Check for algae growth inside the tank; if found, treat water to remove the algae.
- Inspect for erosion around the overflow discharge and repair as necessary.
- Inspect gutters and downspouts. Remove any accumulated leaves or debris.
- Check tank for stability, anchor system if necessary.

c. Above freezing temperatures

- Inspect health of vegetation receiving harvested rainwater to determine watering needs.

3. Above Ground Tanks Specific Maintenance Requirements:

a. Late Fall (Before major freeze)

- Disconnect rainwater harvesting system from roof downspouts.
- Drain and clean out aboveground tanks for winter.

b. Early spring (After last major freeze)

- Connect rainwater harvesting system to roof downspouts

c. Prior to major wind-related storms

- Fill tank to at least half full.

E. Design Examples

Rainwater harvesting examples are presented below. The examples utilize different catchment areas and different storage goals.

Example 1: Residential

A rainwater catchment system is to be installed at a residential home with a roof area of 3,225 ft² (outlined in red below). The system shall be designed to store the WQV. Determine the number of 55-gallon storage tanks required for this system.

Step 1: Define Catchment Area.

The gutter system lines the entire perimeter of the roof and includes four downspouts; therefore the site will require four systems to capture the total water quality volume. In this example, each downspout receives an equal amount of roof area. Given the non-uniform roof shape the catchment area can be calculated by an aerial measurement as shown in **Figure 7003-7** below.



Figure 7003-7: Residential Rainwater Harvesting Example

$$A_c = 3,225 \text{ ft}^2 \times \text{Harvesting Efficiency}$$

$$A_c = (3,225 \text{ ft}^2)(0.90)$$

$$A_c = 2,902.5 \text{ ft}^2$$

Step 2: Determine Storage Volume.

For the catchment area found above, the required WQV is calculated from **Equations 1 and 2** below.

$$WQV = \frac{D_s * R_v * A}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0 * (0.05 + 0.009(100\%)) * 2,902.5 \text{ ft}^2}{12} \left(7.48 \frac{\text{gal}}{\text{ft}^3} \right)$$

$$WQV = 1,719 \text{ gal}$$

Step 3: Select Tank.

Assume selected tank is a standard 55-gallon storage tank. The storage tank has a diameter of 22 inches and is 33.5 inches tall and weighs 18 pounds.

If the overflow pipe must be 2 inches from the top of the storage tank the total height for storage is

$$33.5 \text{ inches} - 2 \text{ inches} = 31.5 \text{ inches}$$

Which equates to 52 gallons available for storage for each storage tank.

In this example the storage volume will be divided evenly between the four downspout locations since they each have the same roof area draining to them. This results in the following:

$$\frac{1,719 \text{ gal}}{4 \text{ downspouts}} = 430 \text{ gal/downspout}$$

$$\frac{\frac{52 \text{ gal}}{\text{rain barrel}}}{430 \frac{\text{gal}}{\text{downspout}}} = 10\% \text{ of WQV treated by a rain barrel at each downspout}$$

To treat the full WQV, a 500-gallon tank could be placed at each downspout.

Step 4: Verify drawdown time

The drawdown time in each tank must be less than or equal to 120 hours. Using **Equation 9**:

$$120 \text{ hr} = \frac{52 \text{ gal}}{Q_{rwh}}$$

The minimum rate of discharge from each tank is calculated to be

$$Q_{rwh} = 0.433 \frac{\text{gal}}{\text{hr}} = 1.61 \times 10^{-5} \text{ cfs}$$

Step 5: Determine orifice size using **Equation 14**

$$Q = CA\sqrt{2gh}$$

$$A = \frac{1.61 \times 10^{-5} \text{ cfs}}{0.6 \sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * 31.5 \text{ in} * \frac{1 \text{ ft}}{12 \text{ in}}}}$$

$$A = 2.06 \times 10^{-6} \text{ ft}^2 = 2.97 \times 10^{-4} \text{ in}^2$$

$$A = \pi \left(\frac{D}{2} \right)^2$$

$$D = 2 * \sqrt{\frac{2.97 \times 10^{-4} \text{ in}^2}{\pi}}$$

$$D = 0.02 \text{ in}$$

Based on the required orifice diameter, a 1/16" outlet or larger shall be used for each tank at the low-flow outlet.

Example 2: Commercial and Industrial

A rainwater catchment system is to be installed at a grocery store. The system shall be designed to store the WQV for the 112,500 ft² roof area outlined in red below as well as an additional volume of water to be reused for irrigation of the 33,380 ft² area outlined in green below. Determine the size number and size of storage tanks required for this system.

Step 1: Define Catchment Area.

The gutter system lines the entire perimeter of the roof and the gutter system includes 10 downspouts, therefore the site will require 10 systems to capture the total water quality volume. In this example, each downspout receives an equal amount of roof area. Given the non-uniform roof shape the catchment area can be calculated by an aerial measurement as shown in **Figure 7003-8**, where the area outlined in red is the catchment area and the area outlined in green is the area to be irrigated.



Figure 7003-8: Commercial Rainwater Harvesting Example

$$A_C = 112,500 \text{ ft}^2$$

$$A_{irr} = 33,380 \text{ ft}^2$$

$$A_{TOTAL} = 145,880 \text{ ft}^2$$

Step 2: Determine Storage Volume.

For the catchment area found above, the required WQV is calculated using **Equations 1 and 2** below.

$$WQV = \frac{D_s * R_v * A_c}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0 * (0.05 + 0.009(100\%)) * 112,500 \text{ ft}^2}{12} \left(7.48 \frac{\text{gal}}{\text{ft}^3} \right)$$

$$WQV = 66,619 \text{ gal}$$

The first flush volume is defined by **Equation 11** below.

$$Vol_{ff} = A_c \left(\frac{1 \text{ gal}}{100 \text{ ft}^2} \right)$$

$$Vol_{ff} = 112,500 \text{ ft}^2 \left(\frac{1 \text{ gal}}{100 \text{ ft}^2} \right)$$

$$Vol_{ff} = 1,125 \text{ gal}$$

$$\frac{Vol_{ff}}{10 \text{ downspouts}} = 112.5 \text{ gal/downspout}$$

Refer to **Table 7003-2** to determine the proper pipe size and length for the first flush diverter. Assume a dual chamber 8" PVC schedule 40 pipe will be used for this design where:

$$2 * 8" \text{ PVC} = \frac{4.63 \text{ in/gal}}{2} = 2.32 \text{ in/gal}$$

$$\begin{aligned} \frac{2.32 \text{ in}}{\text{gal}} * 112.5 \text{ gal} * \frac{1 \text{ ft}}{12 \text{ in}} \\ = 21.75 \text{ ft of dual chamber first flush diverter} \end{aligned}$$

I_{deficit} can be found from the Oklahoma Mesonet Irrigation planner. Assuming a mean irrigation depth of 0.97 inches for the month of August the additional stormwater volume needed for irrigation can be defined using **Equation 12**.

$$Vol_{\text{other}} = 0.6209 I_{\text{deficit}} A_{\text{irr}}$$

$$Vol_{\text{other}} = (0.6209 \frac{\text{gal}}{\text{ft}^2 \text{ in}})(0.97 \text{ in})(33,380 \text{ ft}^2)$$

$$Vol_{\text{other}} = 20,104 \text{ gal}$$

And the total required storage volume is calculated using **Equation 13** below.

$$Vol_{STORAGE} = WQV + Vol_{other} - Vol_{ff}$$

$$Vol_{STORAGE} = 66,619 \text{ gal} + 20,104 \text{ gal} - 1,125 \text{ gal}$$

$$Vol_{STORAGE} = 85,598 \text{ gal}$$

Step 3: Select Tank.

The required storage volume will be divided equally between the 10 downspouts on the building.

$$\frac{85,598 \text{ gal}}{10 \text{ downspouts}} = 8,560 \text{ gal/downspout}$$

Select a 10,000-gallon tank for each downspout location. This is larger than the calculated required storage volume, but this will account for any unusable volume associated with offsets and the overflow structure. A tank of this size will have a preinstalled outlet port and the final step is to verify that the minimum required storage volume is achieved when the unusable volume is subtracted.

Step 4: Verify drawdown time

The drawdown time in each tank must be less than or equal to 120 hours.

$$120 \text{ hr} = \frac{10,000 \text{ gal}}{Q_{rwh}}$$

The minimum rate of discharge from each tank is calculated using **Equation 9** to be

$$Q_{rwh} = 83.33 \frac{\text{gal}}{\text{hr}} = .003 \text{ cfs}$$

Step 5: Determine orifice size using **Equation 14**

$$Q = CA\sqrt{2gh}$$

$$A = \frac{.003 \text{ cfs}}{0.6 \sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * 31.5 \text{ in} * \frac{1 \text{ ft}}{12 \text{ in}}}}$$

$$A = 3.85 \times 10^{-4} \text{ ft}^2$$

$$A = \pi \left(\frac{D}{2} \right)^2$$

$$D = 2 * \sqrt{\frac{3.85 \times 10^{-4} \text{ ft}^2}{\pi}}$$

$$D = 0.02 \text{ ft} = 0.3 \text{ in}$$

Based on the required orifice diameter, a 1/3" outlet or larger shall be used for each tank at the low-flow outlet.

7003.3 Rain Garden

A. Introduction

A rain garden is a vegetated, depressed landscape area designed to capture and infiltrate and/or filter stormwater runoff. The growing medium for the rain garden consists of native soil or biofiltration media. If the infiltration capacity of the subgrade soils is limited, the rain garden can be underlain by an underdrain system. Rain gardens will provide removal of pollutants in stormwater runoff similar to other treatment systems. However, because they are restricted to smaller drainage areas and shallower ponding depths, which necessitate a larger surface area, infiltration, evapotranspiration, and biological uptake mechanisms may be more significant for rain gardens than other treatment SCMs.

There are three different types of rain garden designs included in this section:

- full infiltration (no underdrain);
- partial infiltration (filtration system with raised outlet or partial underdrain); and
- filtration system with little to no infiltration that includes an underdrain.

B. Design Criteria

- Rain gardens are restricted to a contributing drainage area not to exceed two acres and a ponding depth not to exceed 12 inches.
- Rain gardens may be sized to capture and treat the entire water quality volume. The storage volume provided is the combined volume of the ponded water in the basin and the effective porosity volume in the growing medium. Water quality credit is provided for 80% of the effective porosity (assumed to be 30%) of the growing medium.
- Include a minimum of 6 inches of freeboard above the overflow route.
- Drawdown time for rain gardens should not exceed 48-hours.
- Maximize the travel time from the inlet to the outlet. Consider providing pre-treatment to help reduce the extent and frequency of maintenance, especially if the contributing drainage area is expected to generate sediment, debris, or other pollutant that may cause decreased system functionality. Pre-treatment may include a sedimentation chamber, a vegetated or manufactured separator element (to functionally separate the rain garden into higher deposition and lower deposition zones), a

vegetated filter strip, or an inlet designed at a minimal slope to encourage sediment deposition prior to flows entering the rain garden.

- If pedestrian traffic is expected along a non-ADA route, provide stepping stone paths along a predefined route to discourage trampling of vegetation and compaction of soil. Planting spiny vegetation such as yucca, sotol, or agarita along the edge of the rain garden may effectively discourage pedestrian use.
- Design the rain garden depression to be as shallow as possible to facilitate mowing and reduce erosion.
- If rain garden will be installed adjacent to roadway, coordinate with professional engineer and construction services to determine appropriate garden section that will not impact integrity of road. Liner may need to be required along vertical and/or horizontal faces to protect foundations and road bases from seepage.

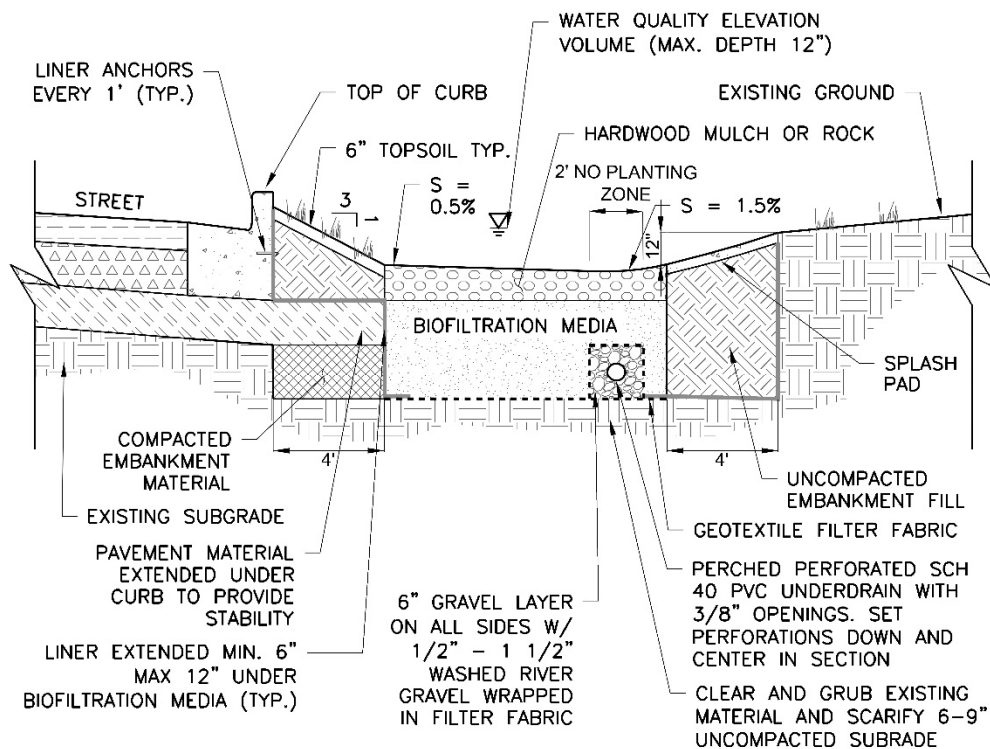


Figure 7003-9: Rain Garden Adjacent to Roadway

The type of rain garden and whether an underdrain is needed are typically dependent on the soil type. A full infiltration rain garden does not need an underdrain and has complete infiltration into native soils (typically have a greater than 2 in/hr infiltration rate). Full filtration rain gardens assume no infiltration into native soils and include an underdrain. Partial infiltration includes an underdrain and partial infiltration into native soils. Practicality of full and partial infiltration depends on the ponding depth. For example, 12"

ponding depth requires 0.25 in/hr infiltration rate for a 48-hour drawdown. If the rain garden is designed such that the ponding depth will be lower, the required infiltration rate will also be lower. Partial infiltration is the preferred design if you have variable soils conditions and want to ensure adequate drawdown over time.

1. Full Infiltration

Full infiltration rain gardens are sized to capture and fully infiltrate runoff. The infiltration area is the average surface area of the rain garden basin (i.e., the area at full ponding depth plus the area at zero ponding depth divided by two). If the side slopes of the basin are not permeable (e.g., masonry or concrete walls), then the infiltration area is the bottom permeable footprint.

The underlying native soil must have a design infiltration rate that will draw down the full ponded depth in less than 48 hours. The design infiltration rate is based on applying at least a factor of safety of two (2) to the measured steady state saturated infiltration rate (i.e., the design infiltration rate is equal to one-half of the measured infiltration rate). For full infiltration systems the infiltration rate of the soil subgrade below the growing medium of the rain garden must be determined using in-situ testing as described in **7002.3**. If a range of values are measured then the geometric mean should be used.

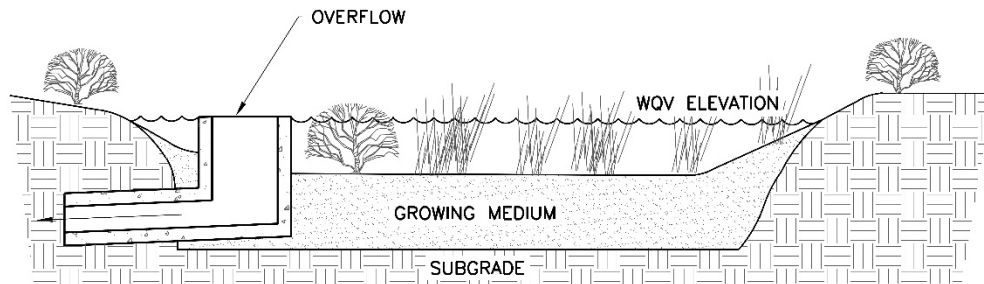


Figure 7003-10: Full Infiltration Rain Garden

$$A_i \geq 0.87 \frac{WQV}{(H+0.24L)} \quad (15)$$

Where,

A_i = Infiltration area (ft²),

WQV = Water quality volume (ft³),

H = Maximum head over the growing medium (ft), and

L = Depth of the growing medium (ft).

The maximum allowable head over the growing medium for a full infiltration rain garden is 12 inches provided the design infiltration rate of

the subgrade soil allows for draw down of the ponded depth in at most 48 hours. Ponding depths in excess of 12 inches are not permitted.

2. Full Filtration

Full filtration rain gardens are sized to capture and convey runoff through a biofiltration bed underlain by an underdrain system. The filtration area is the flat surface area at the bottom of the rain garden basin (i.e., the flat area above the growing medium). The maximum ponding depth for a full filtration rain garden is 12 inches.

$$A_f \geq \frac{WQV}{(H+0.24L)} \quad (16)$$

Where,

A_f = Filtration area (ft²),

WQV = Water quality volume (ft³),

L = Depth of the biofiltration growing medium (ft), and

H = Maximum head over the growing medium (ft).

3. Partial Infiltration

Partial infiltration rain gardens are sized to capture and treat runoff through a biofiltration bed. Runoff exits the biofiltration bed by discharge through a raised outlet pipe and by infiltration into the underlying soil. The filtration area is the flat surface area at the bottom of the rain garden basin (or the flat area above the growing medium). The maximum ponding depth for a partial infiltration rain garden is 12 inches.

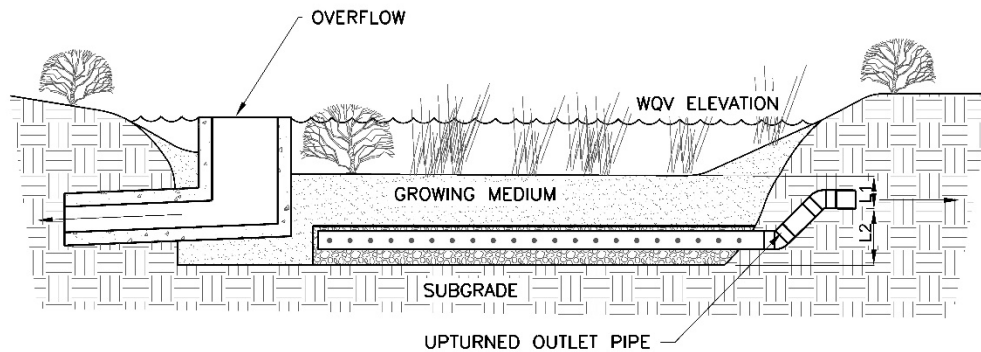


Figure 7003-11: Partial Infiltration Rain Garden

$$A_f \geq \frac{WQV}{(H+0.24L_1+0.24L_f)} \quad (17)$$

Where,

A_f = Filtration area (ft²),

WQV = Water quality volume (ft³),

H = Maximum head over the growing medium (ft) (a maximum of 12 inches),

L₁ = Depth from the top of growing medium to the invert of the raised outlet pipe (ft) (a minimum of 1.2 ft), and

I_f = Infiltration factor (ft).

Growing medium or gravel must be placed across the bottom of the rain garden below the invert of the raised outlet pipe to provide additional storage. Use of growing medium is recommended to promote greater rooting depths and biological activity. The available storage is a function of the depth below the invert of the raised outlet pipe and the porosity of the material. The ability to regenerate storage is a function of the infiltration rate of the subgrade. The infiltration factor, I_f, is based on the depth of storage below the invert of the raised outlet (L₂) and the 2-day drawdown provided by the soil subgrade design infiltration rate (i_{sub}):

- For cases where $L_2 \geq i_{sub} * 2 \text{ days}$,

$$I_F = L_2 \quad (18)$$

- For cases where $L_2 < i_{sub} * 2 \text{ days}$,

$$I_F = i_{sub} * 2 \text{ DAYS} \quad (19)$$

Where,

I_{sub} = Design infiltration rate of subgrade (ft/day), and

L₂ = Depth from the invert of the raised outlet pipe to the subgrade surface (ft) (a minimum of 0.8 feet).

For partial infiltration rain gardens, the design infiltration rate of the soil subgrade below the growing medium may be estimated using the desktop study and field sampling methods as described in 7002.3. For design purposes, the estimated infiltration rate must be reduced by at least a factor of safety of 2 to account for uncertainty in infiltration rate estimates and potential clogging over time.

C. Design Equations

1. Drawdown time

$$t_{dd} = \frac{12D_0}{I} + 4 \text{ hr} \quad (20)$$

Where,

tdd=total drawdown time (hr)

D0=ponding depth (ft)

I=infiltration rate (in/hr)

4 hr=4 hours worth of drawdown time towards WQV (hr)

D. Basin Elements

1. Slopes

Rain gardens should not be located on slopes exceeding 15 percent. Less than 3% is optimal as anything larger than that will be hard to achieve water quality volume without an excessive amount of cells, especially if width is limited.

Side slopes should be 3H:1V or greater for the perimeter of the cell to prevent erosion.

2. Soil Conditions

When siting a full or partial infiltration rain garden, appropriate soil conditions must be present. The depth to an impermeable layer must be at least 12 inches below the bottom of the rain garden.

3. Water Table

Full and partial infiltration rain gardens are not allowed in locations where the depth from the bottom of the growing medium to the highest known groundwater table is less than 12 inches.

4. Bedrock

Full and partial infiltration rain gardens are not allowed in locations where depth from the bottom of the growing medium to bedrock is less than 12 inches. In cases with bedrock less than 3 feet from the bottom of the growing media, soil testing should be conducted in-situ to account for the effect of this limiting horizon.

5. Groundwater and Soil Contamination

Full and partial infiltration rain gardens are not allowed in locations where infiltration would cause or contribute to mobilization or movement of contamination in soil or groundwater or would interfere with operations to remediate groundwater contamination. If infiltration rain gardens are proposed under these conditions, the potential for incidental infiltration should be evaluated to determine whether an impermeable liner must be used.

6. Growing Medium

The rain garden growing medium should have sufficient water holding capacity to support vigorous plant growth, enhancing the ability for plants to survive during dry periods. It should also sustain a healthy microorganism population which, in concert with vegetation, should enhance biological removal of pollutants in stormwater. Requirements for the growing medium depend on the type of rain garden design being considered. For full infiltration rain gardens, the growing medium should be native soil. In the event the designer is not certain about the native soil's ability to support vegetation, a 6 inch layer of topsoil may be

added to the soil. This additional depth of soil must be accounted for in the depth and volume required for the pond. For full filtration and partial infiltration rain gardens, only the biofiltration medium may be used. See **Standard Specification 2105** Biofiltration.

7. Underdrain System and Liners

a. Full Infiltration Rain Garden

- A full infiltration rain garden does not have an underdrain system and does not require a geotextile under the growing medium.

b. Partial Infiltration and Full Filtration Rain Garden

- The underdrain for a partial infiltration and full filtration rain garden consists of gravel-surrounded perforated pipes.

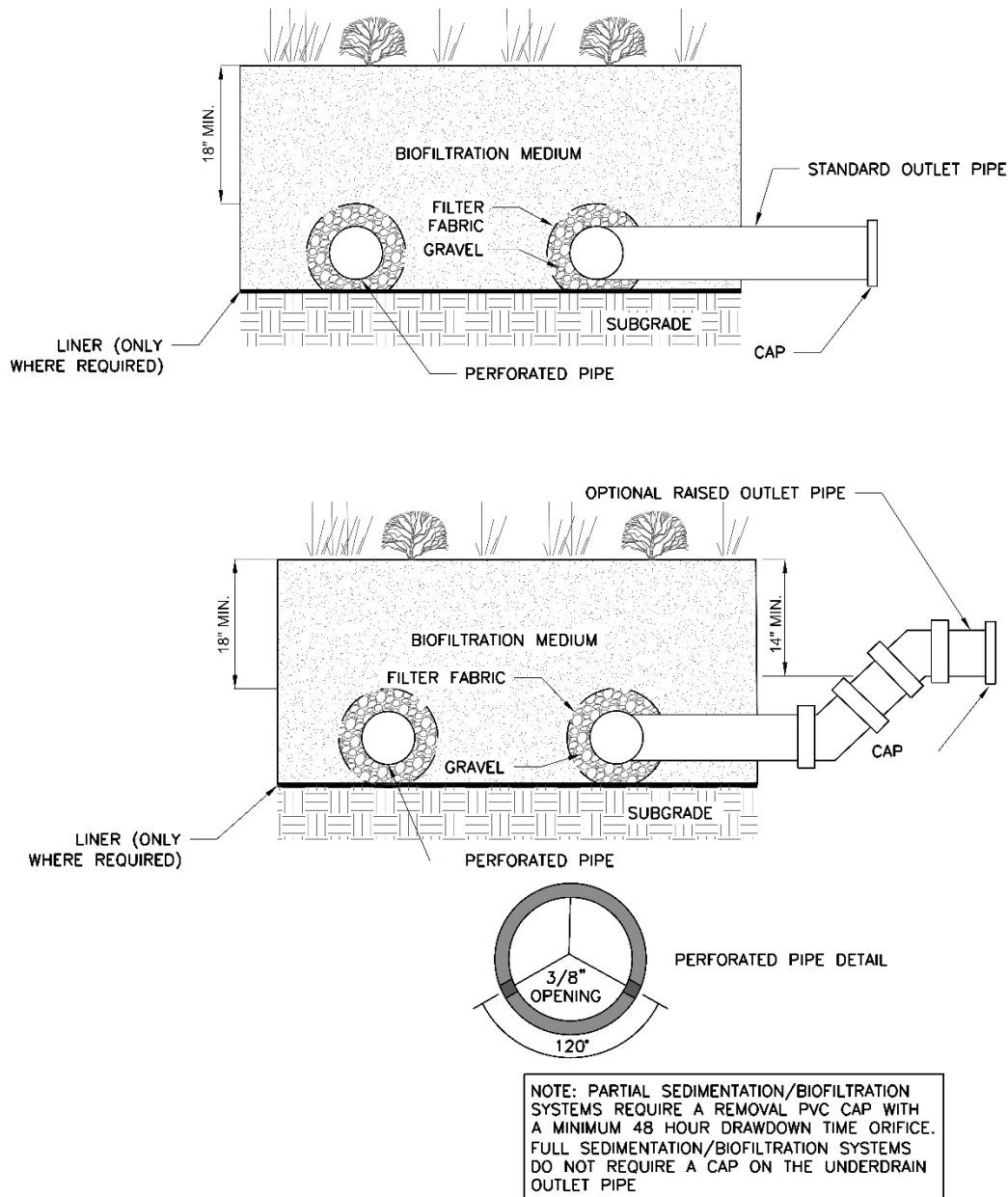


Figure 7003-12: Underdrain Design for Rain Gardens

- c. The underdrain piping must comply with the criteria located in **Section 7004.1D.3**. For partial infiltration systems raised outlets are required to encourage infiltration through the native soils before flow through underdrain. The pipe does not require a slope.
- d. If a rain garden is located next to a roadway then a liner is required along the sides of the measure to protect the roadway section from water infiltration. The liner shall meet the specifications given in **Specification 2106**.

8. Flow Control

a. Inflow

- How runoff enters (and for larger storms overflows or bypasses) the rain garden depends on the overall drainage configuration for the site. Runoff may enter via sheet flow from surrounding areas (for example, a parking lot with a ribbon curb), or runoff may enter as concentrated flow through a curb cut, a splitter box, or other inlet. When using a curb cut approach, ensure that inflow curb cuts have sufficient positive slope into the rain garden to prevent minor obstructions such as leaves in the curblin from obstructing flow into the system. Provide energy dissipation for rain gardens with concentrated points of inflow. The maximum velocity discharged to the rain garden should not exceed 2 feet per second.

b. Internal Flow Management

- Rain gardens located on a sloped area can be designed to pool to a specified water quality elevation and then overflow into downstream cells through a raised outlet structure or level spreader.

c. Outflow

- The preferred design to manage volume in excess of the WQV is to use an offline system configuration such that when the rain garden is full, additional runoff does not enter the system and instead flows past the inflow opening. Outflow of volume in excess of the WQV can also be managed through the use of standpipe risers, elevated catch basins, or down gradient curb cuts. When selecting the type and location of the outlet structure, incorporate enough detail in the design to prevent unintentional bypass of the rain garden before it is full. For example, when using an adjacent curb inlet to a storm drain for overflow, make sure to include sufficient grade control to establish preferential flow to the rain garden. The surface discharge from the rain garden shall be non-erosive with a maximum permissible flow velocity of 2 feet per second. Include a minimum of 6 inches of freeboard above the overflow route.

9. Landscape Design

- a. Although an essential role of the vegetation is to make the rain garden attractive, the highest priority shall be to meet the water quality and soil stabilization functional requirements. Another important function of the vegetation is to help reduce clogging of the growing medium. Vegetation should be selected based on its ability to survive under alternating conditions of inundation and extended dry periods. High plant diversity is recommended and will provide

resiliency to the system and help prevent a situation where all vegetation is lost. Over time, the plant species that are best suited to the unique conditions of each rain garden will naturally self-select and spread. Use of only sod is allowed and requires less long-term maintenance.

- b. Vegetation quantity, size, spacing, and selection shall meet the requirements for filtration basins as provided in **Section 7004.1D.4**, Biofiltration, with the exception that rain gardens do not require a minimum of five different species (i.e., one species is acceptable), although higher diversity is recommended.
- c. Select native vegetation whenever possible to reduce the need for long-term irrigation and maintenance. If rain gardens are over-irrigated and receive significant applications of fertilizers and herbicides, they can become sources of pollution rather than pollutant removal SCMs. Thus, it is essential that these rain garden systems be managed carefully and that an approved and recorded Integrated Pest Management plan be required for the drainage area up to and including the rain garden.
- d. Whenever possible, vegetation should be planted throughout the entire rain garden to provide a fully stabilized surface. Containerized plants are typically grown in a looser growing medium conducive to drainage whereas grass sod is sometimes grown in more cohesive soils that may inhibit drainage. Avoid the use of wood chips because they tend to float and may clog the outlet or be washed downstream. Coarsely-shredded hardwood mulch such as that obtained from the primary run through an industrial tub grinder will be more resistant to movement and is recommended. Gravel or stone mulch is also resistant to movement but may cause sediment to build up and inhibit infiltration.
- e. Designate a no planting zone in the deepest part of the garden to allow maintenance crews to remove deposited sediment over time

E. Construction and Maintenance Requirements

1. Construction

- a. Review design with contractor in the field. Go over importance of meeting elevations, function of inlet location(s), and meeting specs on material.
- b. Restrict and/or limit vehicular and foot traffic around infiltration basin areas.
- c. Install as close to the end of construction as possible.
- d. Off-line construction is preferred.
- e. Keep sediment out of the infiltration device as much as practical.

- f. Clearly mark infiltration areas before work begins to avoid soil compaction or sedimentation to preserve infiltration capacity.
- g. Scarify subgrade before installing fill to loosen up native soil to promote infiltration.
- h. Once area has been excavated, extremely important to move straight into filling with garden media to avoid leaving materials along roadways exposed to weather conditions, which will promote cracking and slides.
- i. Specify in technical specs that a design survey shall be completed to confirm inlet elevations, slope of facility, outlet pipes, pond depths, overflow elevations, etc. Consider showing in the detail which locations should be surveyed. Outline allowable tolerance.
- j. Inspect materials (plants, double washed gravel, media) upon delivery to the site but before install to verify it meets specs. Check watertight seals at HDPE and PVC connections.
- k. Specify construction sequence in construction docs.

2. Maintenance

- a. Unless damaged by unusual sediment loads, high flows, or vandalism, the biofiltration media should be left undisturbed and allowed to age naturally.
- b. Biweekly during first growing season
 - Inspect vegetation until 95% vegetative cover is established. Spot reseed if need be.
- c. Monthly
 - Check for accumulated sediments, remove as needed.
- d. Quarterly
 - Remove debris and accumulated sediment; replace soil media in void areas caused by settlement; repair eroded areas; re-mulch by hand any void areas.
- e. Semi-annually
 - Remove and replace dead or diseased vegetation that is considered beyond treatment (see planting specifications); treat all diseased trees and shrubs mechanically or by hand depending on the insect or disease infestation. If drawdown exceeds the allowable drawdown time, lightly scarify soil with hand cultivator; if standing water remains for greater than 96 hours, remove top layer of sediment, mulch, and potentially vegetation; de-compact soil by scarification, and replace mulch and disturbed vegetation.
- f. Late winter

- Trim bunch grasses; mow turf grasses; harvest other types of vegetation according to recommendations in the planting specifications.

g. Spring

- Remove previous mulch layer and apply new mulch layer by hand (option) once every two to three years.

F. Design Example

Values in the examples are estimated or assumed measured values. The actual design should use field site measured data collected by trained professionals.

A portion of the parking lot of a commercial site (outlined in red below) will be treated with a rain garden (outlined in blue below). The area of the parking lot to be treated is 79,700 ft². This area measurement includes 1,275 ft² of pervious vegetated areas outlined in green below. Determine the required area for a rain garden for full infiltration, partial infiltration, and a full filtration system for an infiltration rate of 0.5 in/hr.



Figure 7003-13: Rain Garden Example

The storage provided by the rain garden should be greater than or equal to the total Water Quality Volume (WQV) calculated below using **Equations 1 and 2**.

$$WQV = \frac{D_s * R_v * A_c}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0(0.05 + 0.009(98.40\%)) * 79,700 \text{ ft}^2}{12}$$

$$WQV = 6,214 \text{ ft}^3$$

Example 1: Full Infiltration

Next, solve for the required infiltration area using **Equation 15**. Assume the maximum ponding depth of 12 inches, a growing medium depth of 2.25 feet, and an infiltration rate of 2.0 in/hr.

$$A_i \geq 0.87 \left(\frac{WQV}{H + 0.24 L} \right)$$

$$3,511 \text{ ft}^2 \geq 0.87 \left(\frac{6,214 \text{ ft}^3}{1.0 \text{ ft} + 0.24(2.25 \text{ ft})} \right)$$

For this ponding depth and medium thickness, a minimum infiltration area of 3,511 ft² is required. If the ponding depth or media thickness are reduced, the required infiltration area will increase. If the media thickness is increased, the required infiltration area will decrease. For this example site, the available infiltration area is 4,295 ft² therefore this will be used for the design.

$$4,295 \text{ ft}^2 \geq 3,511 \text{ ft}^2$$

Next, verify the drawdown time using **Equation 20**.

$$t_{dd} = \frac{12D_0}{I} + 4 \text{ hr}$$

$$t_{dd} = \frac{\left(\frac{12 \text{ in}}{\text{ft}} \right) (1.0 \text{ ft})}{2.0 \frac{\text{in}}{\text{hr}}} + 4 \text{ hr}$$

$$t_{dd} = 10 \text{ hr} < 48 \text{ hr}$$

Design is valid.

Example 2: Partial Infiltration

When the infiltration rate of the native soil does not allow for a full infiltration system, a partial infiltration system can be used where the addition of underdrain piping increases the infiltration rate. For this example assume a maximum ponding depth of 12 inches, a depth from the top of the growing medium to the invert of the raised outlet pipe of 2.0 ft, and an infiltration rate of 0.3 in/hr.

Calculate the infiltration factor, I_f , using **Equation 19**.

$$I_f = I_{sub} * 2 \text{ days}$$

$$I_f = 0.3 \frac{\text{in}}{\text{hr}} * \frac{1 \text{ ft}}{12 \text{ in}} * \frac{24 \text{ hr}}{1 \text{ day}} * 2 \text{ days}$$

$$I_f = 1.2 \text{ ft}$$

Assuming the same filtration area used above, verify the minimum filtration area is achieved by using **Equation 17**.

$$A_i \geq \left(\frac{WQV}{H + 0.24 L + 0.24 I_f} \right)$$

$$3,515 \text{ ft}^2 \geq \left(\frac{6,214 \text{ ft}^3}{1.0 \text{ ft} + 0.24(2.0 \text{ ft}) + 0.24(1.2 \text{ ft})} \right)$$

$$4,295 \text{ ft}^2 \geq 3,515 \text{ ft}^2$$

Calculate the underdrain orifice discharge rate required to achieve a 48-hour drawdown time.

$$Q = \frac{(4,295 \text{ ft}^2 * 1.0 \text{ ft})}{48 \text{ h} * \frac{3,600 \text{ sec}}{1 \text{ hr}}} = 0.025 \text{ cfs}$$

Size the underdrain using **Equation 14**:

$$Q = CA\sqrt{2gh}$$

$$A = \frac{Q}{C\sqrt{2gh}}$$

$$A = \frac{0.025 \text{ cfs}}{0.6\sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * (\frac{3}{2}) \text{ ft}}}$$

$$A = 0.004 \text{ ft}^2$$

$$D = 2 * \sqrt{\frac{A}{\pi}} = .07 \text{ ft} = 0.86 \text{ in}$$

Example 3: Full Filtration System

A full filtration system assumes there is no infiltration into native soils and the drawdown relies entirely on the underdrain system. For this example assume a maximum ponding depth of 12 inches, a biofiltration growing medium depth of 1.5 ft, and a native soil infiltration rate of 0.05 in/hr.

First verify the minimum infiltration area is achieved by using **Equation 16**.

$$A_i \geq \left(\frac{WQV}{H + 0.24 L} \right)$$

$$4,295 \text{ ft}^2 \geq 0.87 \left(\frac{6,214 \text{ ft}^3}{1 \text{ ft} + 0.24(1.5 \text{ ft})} \right)$$

$$4,295 \text{ ft}^2 \geq 3,975 \text{ ft}^2$$

Calculate the underdrain orifice discharge rate required to achieve a 48 hour drawdown time.

$$Q = \frac{(4,295 \text{ ft}^2 * 1.0 \text{ ft})}{48 \text{ hr} * \frac{3,600 \text{ sec}}{1 \text{ hr}}} = 0.025 \text{ cfs}$$

Size the underdrain using **Equation 14**:

$$Q = CA\sqrt{2gh}$$

$$A = \frac{Q}{C\sqrt{2gh}}$$

$$A = \frac{0.025 \text{ cfs}}{0.6\sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * (\frac{3}{2}) \text{ ft}}}$$

$$A = 0.004 \text{ ft}^2$$

$$D = 2 * \sqrt{\frac{A}{\pi}} = .07 \text{ ft} = 0.86 \text{ in}$$

7003.4 Infiltration Trench

A. Introduction

Infiltration trenches are excavations typically filled with stone to create an underground reservoir for stormwater runoff. This runoff volume gradually infiltrates through the bottom and sides of the trench into the subsoil over a set design period. By diverting runoff into the soil, an infiltration trench not only treats the water quality volume, but also helps to preserve the natural water balance on a site and can recharge groundwater and preserve baseflow. Due to this fact, infiltration systems are limited to areas with highly porous soils where the water table and/or bedrock are located well below the bottom of the trench.

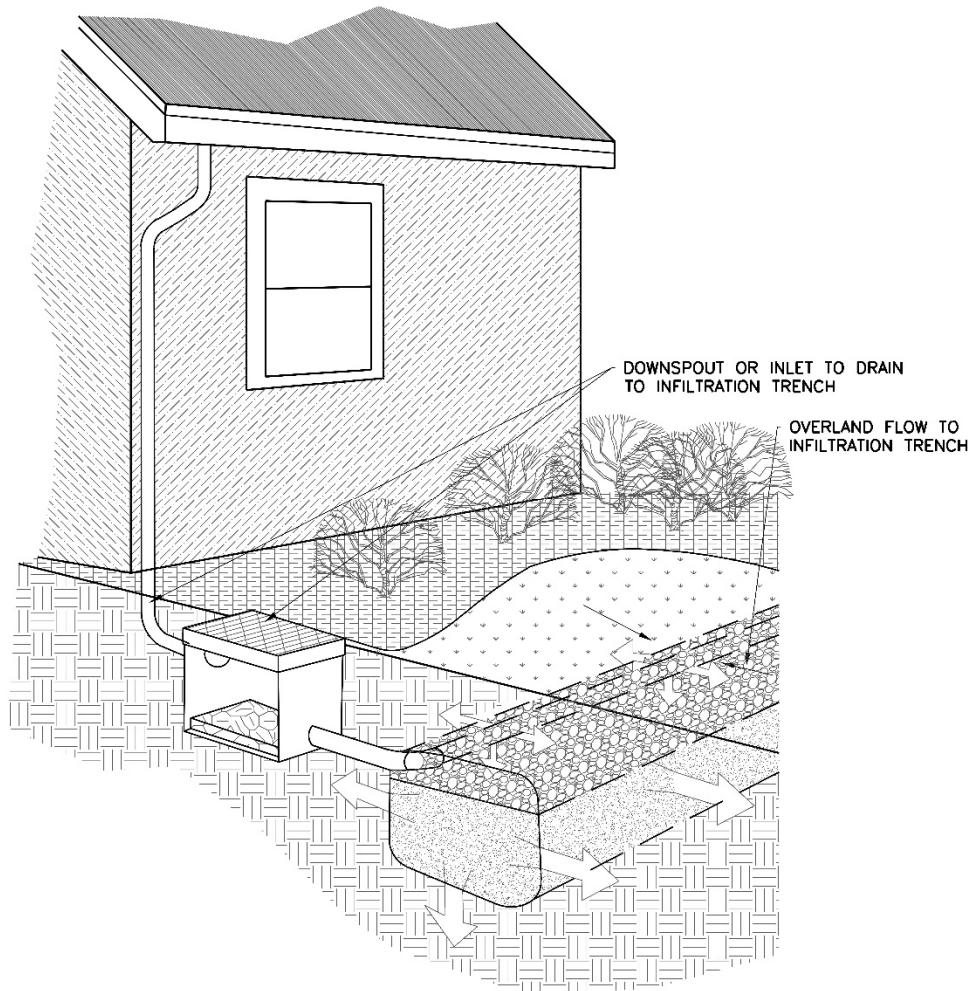


Figure 7003-14: Infiltration Trench Diagram

Infiltration trenches must be carefully sited to avoid the potential of groundwater contamination. Infiltration trenches are not intended to trap sediment and must always be designed with pretreatment measures to prevent clogging and failure. Due to their high potential for failure, these facilities must only be considered for sites where upstream sediment control can be ensured. They are applicable primarily for impervious areas where there are not high levels of fine particulates (clay/silt soils) in the runoff and should only be considered for sites where the sediment load is relatively low.

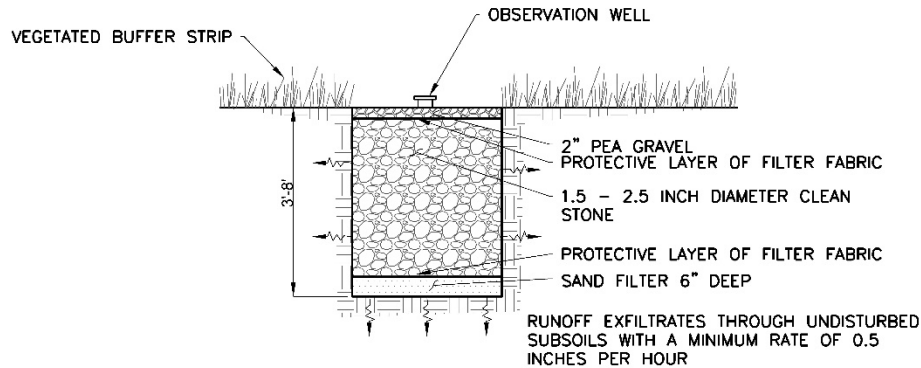


Figure 7003-15: Infiltration Trench Cross-Section

Infiltration trenches can either be used to capture sheet flow from a drainage area or function as an offline device. Due to the relatively narrow shape, infiltration trenches can be adapted to many different types of sites and can be utilized in retrofit situations. Unlike some other structural storm water controls, they can easily fit into the margin, perimeter, or other unused areas of developed sites. To protect groundwater from potential contamination, runoff from designated hotspot land uses or activities must not be infiltrated. Infiltration trenches should not be used for manufacturing and industrial sites, where there is a potential for high concentrations of soluble pollutants and heavy metals. In addition, infiltration should not be considered for areas with a high pesticide concentration.

B. Design Criteria

1. Trench Size

- a. The infiltration trench volume shall be greater than or equal to the water quality volume.
- b. The trench depth shall be between 3 and 8 feet.
- c. The trench cross sectional area shall be at least 8 square feet.
- d. The trench surface area shall be determined using the following equation:

$$A = \frac{WQV}{\left(nd + k_{12} \frac{T}{12}\right)} \quad (21)$$

Where,

A=Surface Area

WQV=Water quality volume

n=stone porosity

d=trench depth (feet)

k =percolation (inches/hour)

T =fill time (hours), (time for trench to fill with water, assume 2 hours for most designs)

2. Infiltration Trench Drainage

- a. A minimum infiltration rate of 0.5 inches/hour is required for the native soil subgrade.
- b. The trench shall have a minimum drawdown time of 10 hours, and a maximum drawdown time of 2 days.
- c. The maximum contributing drainage area shall be less than or equal to 5 acres.
- d. There shall be a minimum of 5 feet between the bottom of the infiltration trench and the seasonally high groundwater elevation.

3. Trench Elements

- a. The drainage layer shall consist of 12 to 18 inches of open graded washed 1.5-2.5 inch diameter round or crushed rock/stone with a void space of 30-40%.
 - Aggregate contaminated with soil shall not be used.
 - Unless aggregate specific data is available a porosity value of 0.32 shall be used for design calculations.
- b. A 6-inch layer of clean, washed sand shall be placed at the bottom of the trench.
- c. A vegetated buffer strip around the entire trench is required if receiving runoff from multiple directions.
- d. A trench receiving sheet flow from an adjacent area shall have a pretreatment system consisting of a vegetated filter strip meeting the requirements detailed in **Section 7003.1** of this document.

4. Geotextile Fabric

- a. Geotextile fabric shall be placed between the trench fill and the native soil.
- b. Geotextile fabric shall have greater permeability than the parent soil, but still prevent sediment from passing into the stone aggregate.

5. Pretreatment shall be included as part of the system

- a. Pretreatment shall be capable of holding 25% of the WQV.
- b. When the soil infiltration rate is greater than 2 inches per hour pretreatment shall be capable of holding 50% of the WQV.
- c. Pretreatment shall consist of a sediment forebay and grass channel or vegetated filter strip.

- d. Exit velocities from pretreatment must be non-erosive.

6. Observation Well

- a. At least one observation well shall be installed in the infiltration trench.
- b. An observation well shall consist of a perforated PVC pipe extending to the bottom of the trench.
- c. Perforated PVC pipe shall be between 4 and 6 inches in diameter.
- d. The well shall be installed along the centerline of the trench, flush with the ground elevation of the trench.
- e. The top of the well shall be capped.
- f. At least 2 observation wells are required for trenches with a surface area greater than or equal to 20,000 feet.

7. Location

- a. Infiltration trenches shall not be constructed under current or future impervious surfaces.
- b. Infiltration trenches must not be used on manufacturing and industrial sites or areas with high pesticide concentrations.
- c. Minimum Offset from Facilities

Location	Offset Requirement
Property Line	10 feet
Building Foundation	25 feet
Private Water Supply Well	100 feet
Public Water Supply Well	1,200 feet
Septic System Tank/Leach Field	100 feet
Class SA Waters	30 feet
Surface Waters	30 feet
Surface Drinking Water Source	400 feet

C. Construction and Maintenance Requirements

1. Construction

- a. Infiltration trenches shall be constructed in native soil.
- b. Infiltration trenches shall not be subject to vehicular traffic or construction work that would compact the soil and reduce the permeability.
- c. Trench excavation shall be limited to the width and depth specified in the design.
- d. The trench shall be scarified before the sand is placed.
- e. The sides of the trench shall be trimmed of all large roots.

- f. The sidewalls must be uniform with no voids and scarified prior to backfilling.
- g. All infiltration trench facilities shall be protected during site construction and shall be constructed after upstream areas have been stabilized.

2. Maintenance

- a. Sediment shall be removed after 50% of the pretreatment capacity has been lost.
- b. The geotextile fabric serves as a sediment barrier and therefore will need to be replaced.
- c. The observation well shall be used to determine:
 - The rate of dewatering after a storm.
 - Sediment levels within the trench.
 - When the geotextile fabric at the top is clogged and requires maintenance.

D. Design Example

A portion of the parking lot of a commercial site (outlined in red below) will be treated with an infiltration trench (outlined in blue below). The area of the parking lot to be treated is 30,852 ft². This area measurement includes 1,320 ft² of pervious vegetated areas (outlined in green below). If the length of the infiltration trench shall be 125 ft, determine an acceptable width and depth for the trench if the infiltration rate is 0.5 in/hr.



Figure 7003-16: Infiltration Trench Example

Step 1: Calculate WQV using **Equations 1 and 2**

$$WQV = \frac{1.0 * R_v * A_c}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0 * (0.05 + 0.009(95.72\%)) * 30,852 \text{ ft}^2}{12}$$

$$WQV = 2,343 \text{ ft}^3$$

Step 2: Determine the required surface area of the trench using **Equation 21** assuming a trench depth of 4 feet and length of 125 feet.

$$A_{BRC} = \frac{WQV}{(nd + k \frac{T}{12})}$$

$$A_{BRC} = \frac{2,343 \text{ ft}^3}{(0.32)d + (0.5 \frac{\text{in}}{\text{hr}})(\frac{2 \text{ hr}}{12})}$$

The above calculations result in the following:

Trench design:

Depth=4 ft

Surface area=1,718 ft²

Length=125 ft

Width=13.7 ft

7003.5 Green Roofs

A. Introduction

Green roofs are an alternative to traditional impervious roof surfaces. They typically consist of underlying waterproofing and drainage materials and an overlying engineered growing media that is designed to support plant growth. Stormwater runoff is captured and temporarily stored in the engineered growing media, where it is subjected to the hydrologic processes of evaporation and transpiration with any remaining stormwater conveyed back into the rooftop stormwater conveyance system. This allows green roofs to provide measurable reductions in post-construction stormwater runoff rates, volumes, and pollutant loads on development sites.

Other than the water quality component, green roofs offer an array of additional benefits, including extended roof lifespan (due to additional

sealing, liners, and insulation), improved building insulation and energy use, reduction of urban heat island effects, opportunities for recreation and rooftop gardening, noise attenuation, air quality improvement, bird and insect habitat, heat reduction, value creation, and visual mitigation.

They are designed to drain stormwater runoff vertically through engineered growing media and then horizontally through a drainage layer that is sloped towards an outlet. There are two type of green roof systems:

1. Intensive system

These green roofs have a thick layer of engineered growing media (usually 12-24 inches or more) that support a diverse understory plant community that may include trees if lightweight small geofoam fill is used.

2. Extensive system

These green roof systems typically have a much thinner layer of engineered growing media (2-6 inches) that supports drought tolerant vegetation. Due to less media and structure loading limitations, these systems are usually lighter and less expensive.

B. Design Criteria

Green roofs are only used to replace traditional impervious roof surfaces. They should not be used to treat any stormwater generated elsewhere on the development site. All green roofs should be designed in accordance with the ASTM International Green Roof Standards (such as ASTM, 2005a, ASTM, 2005b, ASTM, 2005c, ASTM, 2005d, ASTM, 2006).

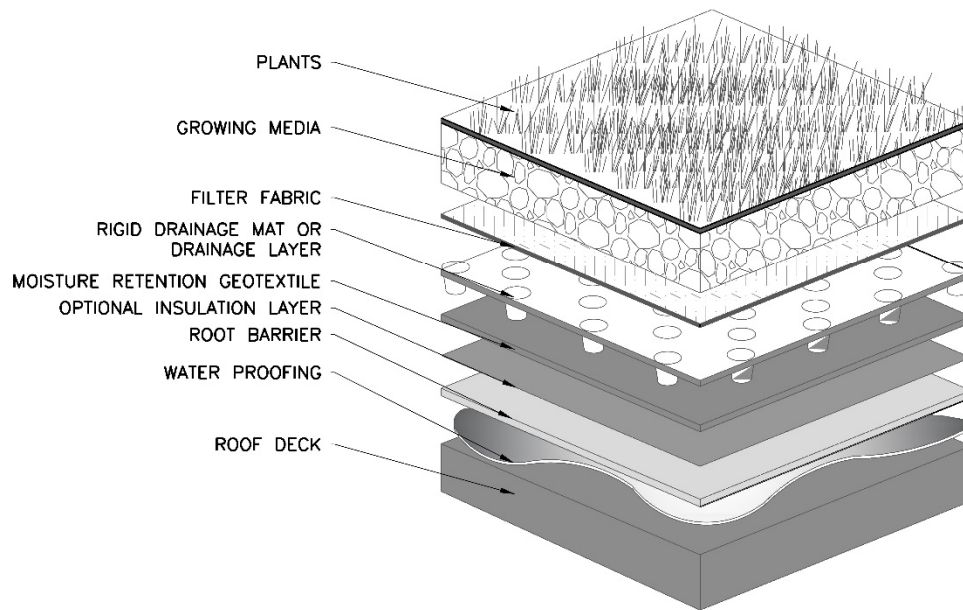


Figure 7003-17: Green Roof Layers

1. Layers

a. Roof Deck

- Designed to capture water quality volume flowing to the roof. Optimal slope is 1-2%. Green roofs not recommended for use on rooftops with slopes greater than 10% unless baffles are used. With baffles, 15% max.
- Coordinate with a professional engineer to ensure rooftop is designed to support an additional load for the green roof design.

b. Waterproofing layer

- All green roof systems should include a waterproofing layer that will prevent stormwater runoff from damaging the underlying rooftop. Waterproofing materials typically used in green roof installation includes, but is not limited to, reinforced thermoplastic and synthetic rubber membranes.
- Do not expose to sunlight to maximize life of the green roof.

c. Root Barrier

- Must extend under any gravel ballast, under the growing medium, and up the side of any vertical elements. Some

waterproofing materials also contribute as a root barrier but do not suffice alone.

- Chemical root barriers or physical root barriers with pesticides, metals, or chemicals that may leach into post-construction stormwater runoff should not be used.

d. Insulation

- An optional layer (but usually required by building standard code) and can occur: under the slab/roof deck, under the waterproof membrane, or above the waterproof membrane.

e. Moisture Retention Geotextile/Protection Layer

- Synthetic material under drainage mat or drainage layer.

f. Rigid Drainage Mat or Drainage Layer

- To assist in conveying runoff to the building drainage system, a semi-rigid, plastic geocomposite drain or mat layer should be included in the design of a green roof. If the roof is flat, a perforated network may be necessary to help rainfall drain properly. Washed granular material can also be used in place of a mat. This should be a minimum 2 inch layer of clean, washed granular material, an often lightweight aggregate.

g. Geotextile

- To prevent clogging within the drainage layer, the engineered growing media should be separated from the drainage layer by a layer of permeable geotextile. The geotextile should be a non-woven geotextile with a permeability that is greater than or equal to the hydraulic conductivity of the overlying engineered growing media.

h. Growing Media

- Refer to **Specification 2105** for Biofiltration Medium makeup.
- The required depth of the drainage layer will be governed by the required storage capacity of the green roof system and by the structural capacity of the rooftop itself. The engineered growing media should have a maximum water retention capacity of approximately 30%.
- The engineered growing media should be between 4-6 inches deep or 12-24 inches deep for intensive and extensive system, respectively, unless synthetic moisture retention materials (e.g., drainage mat with moisture storage “cups”) are placed directly beneath the engineered growing media layer. When synthetic moisture retention materials are

used, a less deep engineered growing media layer may be used.

i. Plants

- A landscaping plan should be prepared for all green roofs. The landscaping plan should be reviewed and approved by the City prior to construction.
- When developing a landscaping plan, site planning and design teams are required to consult with a botanist, landscape architect, or other qualified professional to identify plants that will tolerate the harsh growing conditions found on rooftops. Planting recommendations for green roofs include:
 - Drought- and sun-tolerant vegetation that requires minimal irrigation after establishment.
 - Flowering plants that may assist in adding to or maintaining habitat for pollinators.
 - Low maintenance vegetation.
 - Vegetation that is fire resistant and able to withstand heat, cold, and high winds.
 - Because sedum and succulent plants possess many of the characteristics listed above, they are recommended for use on green roof. Herbs, forbs, grasses, and other groundcovers may be used, but these plants typically have higher watering and maintenance requirements.
 - 90% native or adapted species per Section B of Appendix F of Zoning Ordinance, Trees and Plants for Oklahoma City, 2016, and/or OSU Extension's Plant Selections for Oklahoma
 - No federal or state invasives.
 - Extend the roof flashing 6 inches above engineered growing media and protect by counter flashing.
 - Must achieve 80% vegetation coverage within 1 year.

2. Non-Green Components

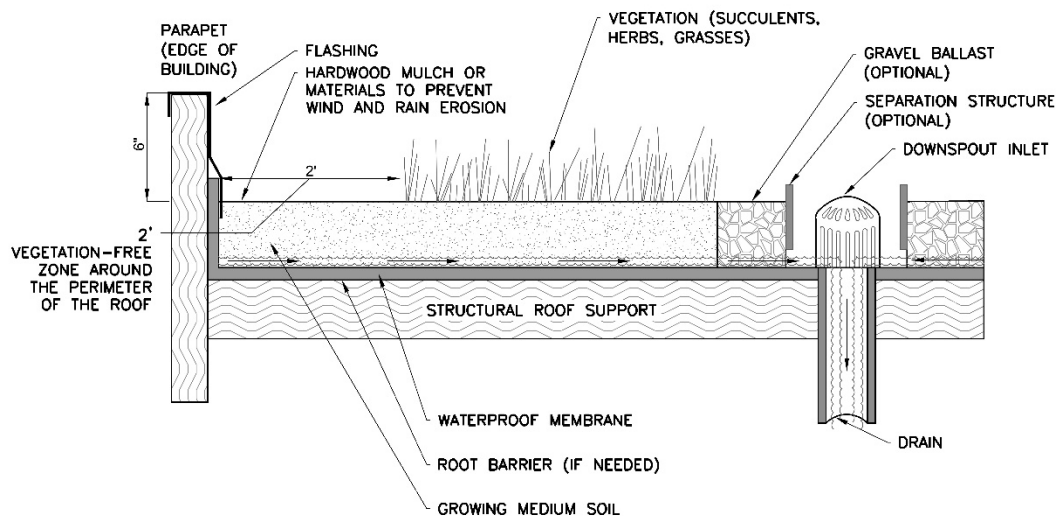


Figure 7003-18: Green Roof Cross-Section

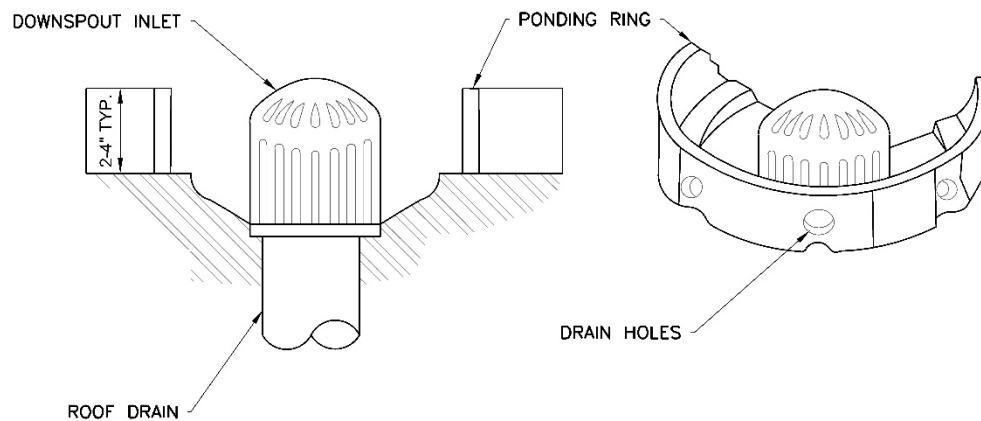


Figure 7003-19: Green Roof Downspout Inlet

- a. Outlets should be provided to convey stormwater runoff out of the drainage layer and off the rooftop when the green roof becomes saturated.
- b. Consideration should be given to the stormwater runoff rates and volumes generated by larger storm events to design green roofs that are able to safely convey or bypass these flows. The roof drainage system must sustain the 100-year storm and be able to handle blocked flows. An overflow system, such as a traditional rooftop drainage system with inlets set slightly above the elevation of the surface of the green roof, should be designed to convey the stormwater runoff generated by these larger storm events safely off the rooftop.
- c. Minimize the use of copper or galvanized metal fittings which can introduce pollutants to the runoff.

- d. Rigid pavements or gravel ballast can be placed along the perimeter of the roof and at air vents or other vertical elements for maintenance access.
- e. Well-designed header or separation boards with reliable soil separators and drainage capability may be placed between gravel ballast and adjacent elements such as soil or drains.
- f. A vegetation-free zone of approximately 2 feet shall be provided around the perimeter of the roof and 12 inches from any roof penetrations. The vegetation-free zone does not apply to walkways. Include in the design plan a roof layout to show all roof features and vegetated areas.
- g. Extend the roof flashing 6 inches above engineered growing media and protect by counter flashing.

3. Additional Considerations

- a. Direct rainfall runoff to adjacent landscape at grade and/or collect & recycle back to green roof
- b. Always use drip irrigation and/or spray irrigation.
- c. Meet at least 50% of green roof irrigation using non-potable sources such as HVAC condensate, rain-water collection, or other auxiliary water sources.

C. Construction and Maintenance Requirements

1. Construction

- a. Avoid damage to the waterproofing membrane during installation of the green roof. If the integrity of the membrane is compromised in a manner that may cause leaks or roof damage, the area must be identified and repaired. Visually inspect for damage and test the membrane for water tightness prior to installation of the engineered growing media.
- b. If the roof is sloped, stabilization measures may be required before installing the green roof to prevent soil from sliding down the roof. Some situations may allow the stabilization measures to be incorporated into the roof structure.
- c. If using a proprietary system, install the green roof according to the manufacturer's instructions, subject to approval relative to conditions herein.
- d. To help prevent compaction of the engineered growing media, heavy foot traffic should be kept off of green roof surfaces during and after construction. Compaction should be anticipated – plan for remediation and ongoing replenishment.

- e. Construction contracts should contain a replacement warranty that covers at least three growing seasons to help ensure adequate growth and survival of the vegetation planted on a green roof.

2. Maintenance

a. As needed

- Water to promote plant growth and survival.
- Mow and remove grass clippings.
- Remove trash, debris, and other pollutants from the rooftop.
- Observe infiltration rates after rain events, the roof should drain in 24 hours of rain event.

b. Monthly

- Inspect for weeds and conduct weeding during spring (March – May) and fall (September – November).
- Inspect green roof for dead or dying vegetation. Dead vegetation should be removed along with any woody vegetation. Plant replacement vegetation as needed.

c. Semi-annually (quarterly during first year)

- Inspect waterproof membrane for leaks. Repair as needed.
- Inspect outflow and overflow areas for trash, debris, and sediment accumulation. Remove any accumulated sediment or debris.
- Inspect vegetation for signs of stress. If vegetation begins showing signs of stress, including drought, flooding, disease, nutrient deficiency, or insect attack, treat the problem or replace the vegetation.
- Inspect irrigation system. Repair as needed.
- Weed and prune vegetation.

d. Annually

- Test the planting soils for pH levels. Consult with a qualified licensed arborist, botanist, and/or soil scientist to determine and maintain the optimal pH levels. A wireless telemetry option can be used to measure soil moisture and chemistry to assist with live information and serve as a teaching tool for the public.

D. Design Example

A portion of a commercial building's roof is to be converted to a green roof. It is assumed that the green roof will retain 100% of WQV for the roof area

it covers (outlined in red below). If the total roof area is 112,878 ft² and the green roof will cover 40,772 ft², determine the resulting reduction in the WQV.



Figure 7003-20: Green Roof Example

Step 1: Calculate the total WQV for the entire roof using [Equations 1 and 2](#)

Total roof area=112,878 ft²

$$WQV = \frac{1.0 * R_v * A_C}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0 * (0.05 + 0.009(100\%)) * 112,878 \text{ ft}^2}{12}$$

$$WQV = 8,936 \text{ ft}^3$$

Step 2: Calculate the new WQV given the addition of the green roof

$$WQV = \frac{1.0 * (0.05 + 0.009(100\%)) * (112,878 \text{ ft}^2 - 40,772 \text{ ft}^2)}{12}$$

$$WQV = 5,706 \text{ ft}^3$$

The percent reduction in the WQV can be calculated as

$$\%Reduction = \left(\frac{8,936 \text{ ft}^3 - 5,706 \text{ ft}^3}{8,936 \text{ ft}^3} \right) * 100$$

$$\%Reduction = 36.1\%$$

7003.6 Permeable Materials

A. Introduction

Increasing a site's permeable surfaces allows for natural filtration and reduces the costs associated with adding stormwater management systems by reducing the amount of runoff from a site. Permeable materials can be applied to traditional impervious surfaces like roadways and sidewalks using a variety of material types.

Grid pavement systems are structural grids that are on top of a bedding layer that have space within the grid for permeable material. Aggregate and turf grass commonly fill the spaces within the grids system.

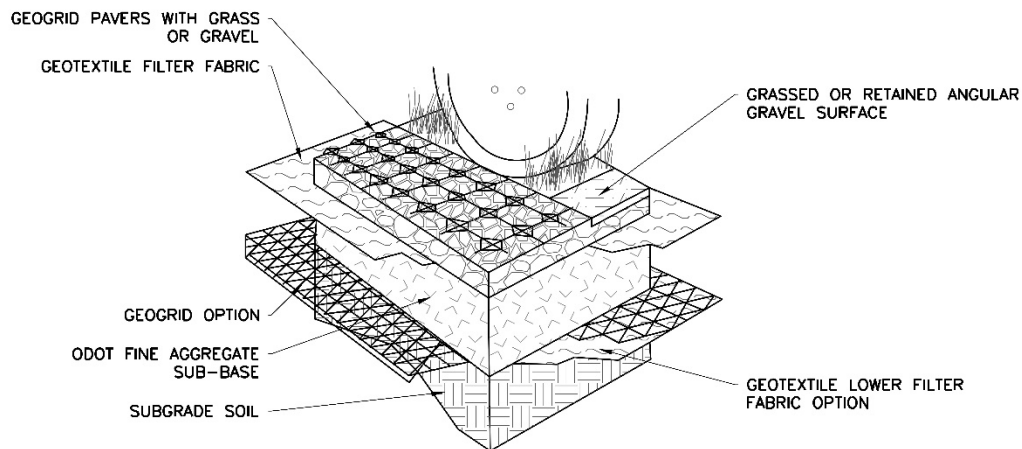


Figure 7003-21: Permeable Paver Diagram

Pavers, also referred to as Permeable Interlocking Concrete Pavers (PICPs), are blocks made from a wide variety of materials that are on top of an open graded base layer. They are typically used to provide aesthetic value to a site while being able to support the weight of a car. Water is able to drain through the openings between the blocks and naturally drain through well drained subgrade or to an underdrain system.

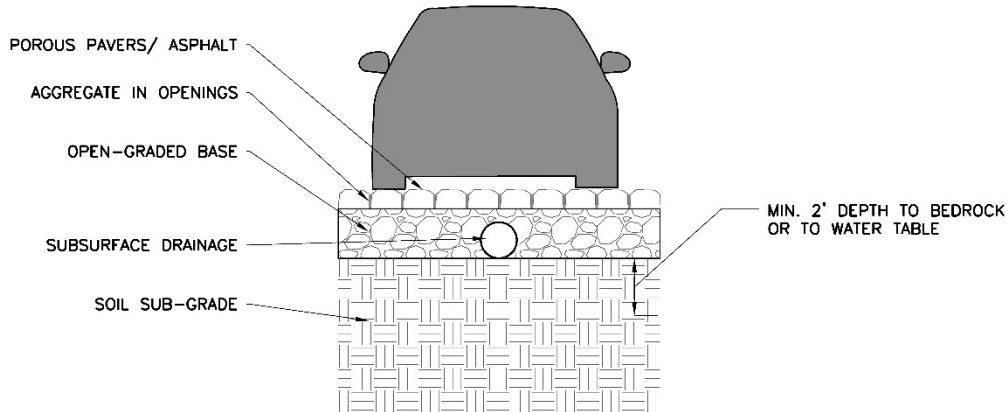


Figure 7003-22: Porous Pavers / Asphalt Cross-Section

Pervious concrete consists of a specially formulated mixture of Portland cement, uniform, open graded course aggregate, and water. The concrete layer has a high permeability, such that the underlying permeable soil layer allows rapid percolation of rainwater through the surface and into the layers beneath.

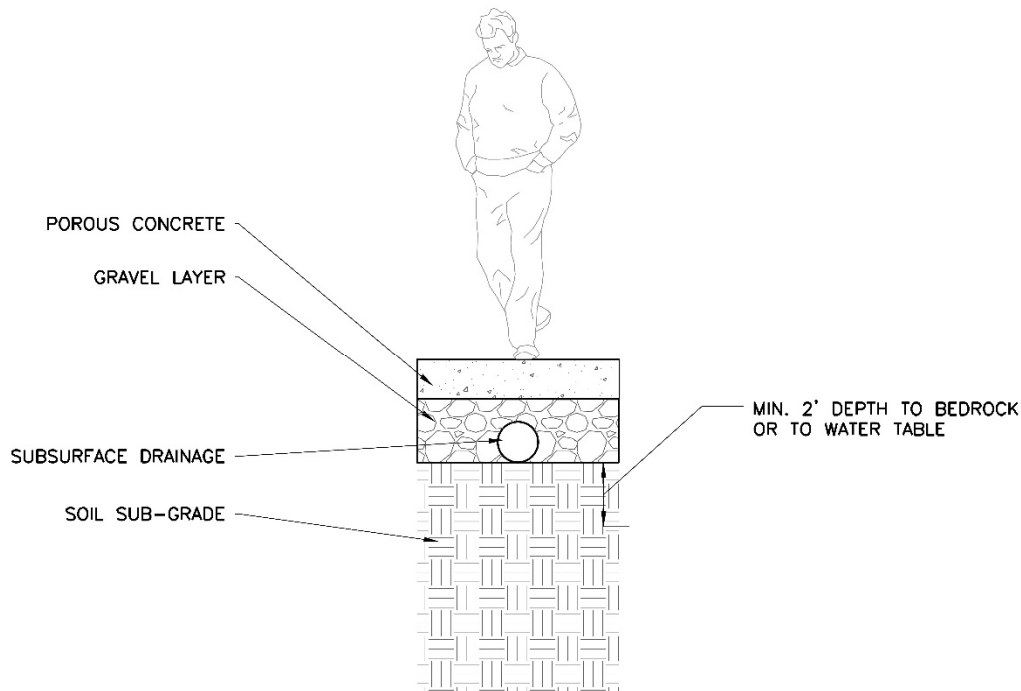


Figure 7003-23: Porous Concrete Cross-Section

Porous asphalt is asphalt with large void spaces to allow water to drain through it. Porous asphalt allows water to infiltrate into the subsoil through the paved

surface and a base, aggregate layer that acts as both a structural layer and container to temporarily hold water. Porous asphalt is generally used on sidewalks, bicycle paths, or roads with low traffic volumes.

B. Design Criteria Applicable to All Permeable Materials

1. Drawdown time for the subbase storage material should not exceed 48-hours.
2. A minimum distance of 2 feet from the seasonally high groundwater elevation to the bottom of the aggregate base is required.
3. A minimum infiltration rate of 0.5 inches/hour is required for the native soil subgrade.
4. Where the infiltration rate is less than 2 inches/hour the pavement section shall sheet flow to a properly sized filter strip or the pervious pavement subsurface rock shall be sized for the required infiltration rate.
5. Surfaces shall be stable, firm, and slip resistant
6. Gravel base layer
 - a. The gravel base course shall be designed to store the water quality volume at a minimum.
 - b. The stone aggregate used shall be washed, bank-run gravel with a diameter of 1.5-2.5 inches.
 - c. The gravel layer shall have about 40% void space.
 - d. The gravel base layer shall have a minimum depth of 12 inches.
 - e. Aggregate contaminated with soil shall not be used.
7. Permeable pavement system offset:

Location	Required Offset
Building	15 feet down gradient
Drinking water wells	100 feet

8. Pervious pavement must not be constructed over fill soils.
9. A subgrade geotextile layer may be used to separate the native soil subgrade and aggregate base layers but is not required.
10. If an underdrain is used for collection, the conveyance must lead to a vegetated facility sized to treat the entire pervious paved area.
11. If runoff is coming from adjacent pervious areas, the pervious areas shall be fully stabilized to reduce sediment loads and prevent clogging of the permeable pavement surface.
12. No permeable pavement system shall be installed in areas that dispense gasoline or other liquid engine fuels or where other hazardous materials are used or stored.

13. Unless otherwise approved, only porous asphalt, pervious concrete, and paver blocks may be installed in drive aisles and driveways.
14. If the pavement is a load bearing surface, the pavers must be able to support the maximum load.
15. Grid systems with turf grass cannot be used to meet minimum off-street parking.
16. Gravel based grid systems can only be used in industrial zoning districts as defined in the City of Norman Zoning Ordinance.
17. Parking spaces shall be marked with traditional striping methods or with alternative markings.
18. Pervious pavement must be designed to directly infiltrate all stormwater from the pavement surface into a crushed rock storage layer.
19. The gravel base layer must contain enough void space to store the 10-year, 24-hour storm.
20. Subsurface Drainage
 - a. An underdrain shall be used when the in-situ soil cannot drain the WQV within 48 hours or if the system is lined with an impermeable barrier.
 - b. An upturned elbow underdrain shall be used when the in-situ soil can meet the WQV drawdown requirements.
 - c. An overdrain pipe shall be used when there is a risk of surface flooding and freeze-thaw conditions.
 - d. There shall be a minimum of one cleanout per lateral line with additional cleanouts placed every 100 feet.
 - e. Permeable pavement drainpipe configurations:

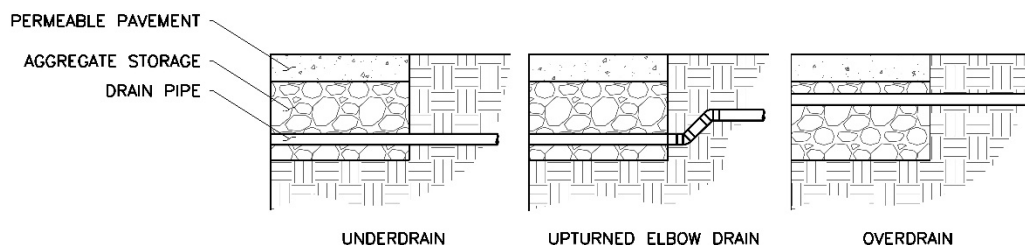


Figure 7003-24: Permeable Pavement Underdrain Diagram

C. Grid Paver System Specific Design Criteria

1. Slopes shall be between 5 and 10 percent. If used for an ADA walking surface, the max slope shall be 5 %.
2. The ratio of the contributing impervious area to the permeable paver surface area shall not exceed 3:1.

3. The entire stormwater volume must infiltrate into the subgrade.
4. A minimum of 40% of the surface area shall consist of open void spaces. Voids must be $\frac{1}{2}$ " or less in diameter
5. A porosity value of 0.32 shall be used for calculations unless the information is available for the manufacturer.
6. Paver blocks shall have a minimum thickness of 3.125 inches.

D. Paver Blocks Specific Design Criteria

1. The ratio of contributing impervious area to the permeable paver surface area should be no greater than 3:1.
2. Slope shall not exceed 5%.
3. Systems must conform to manufacturer specifications.
4. Pavers shall have a minimum compressive strength of 8,000 psi.
5. Pavers shall have a minimum thickness of 2.36 inches.
6. A 2-inch-thick bedding layer of ASTM No. 8 stone shall be included above the reservoir layer and below the paver blocks.

E. Pervious Concrete Specific Design Criteria

1. The maximum acceptable site slope is 6%. If used for an ADA walking surface, the max slope shall be 5 %.
2. The maximum ratio of the tributary impervious area to the area of pervious concrete is 1:1.
3. The layer of pervious concrete shall be between 6 and 12 inches thick.
4. Assume a porosity of 0.18 for the pervious concrete layer unless aggregate-specific data is available.

F. Porous Asphalt Specific Design Criteria

1. Slopes shall be between 5 and 10 percent. If used for an ADA walking surface, the max slope shall be 5 %.
2. The ratio of the contributing impervious area to the permeable paver surface area shall not exceed 3:1.
3. A minimum of 40% of the surface area shall consist of open void spaces. Voids must be $\frac{1}{2}$ " or less in diameter
4. A porosity value of 0.32 shall be used for calculations unless the information is available for the manufacturer.
5. Porous asphalt systems should be sized for a minimum drawdown time of 24 hours and a maximum drawdown time of 48 hours.
6. The surface of the subgrade shall be lined with an 8-inch layer of sand (ASTM C-33 concrete sand).

7. The porous asphalt layer shall be between 4 and 8 inches deep.
8. The reservoir layer shall be 2 to 4 feet deep.

G. Construction and Maintenance Requirements

1. Construction Requirements for All Permeable Pavement System Types

- a. The area to be paved shall be leveled and lightly compacted with a plate compactor to include the specified grade away from foundations.
- b. During construction the subgrade shall be protected from compaction, and sediment accumulation after installation.
- c. A pervious pavement protection plan shall be required in order to protect the surface from compaction during construction.
- d. The in-situ soil shall be scarified before the geotextile and aggregate base are installed.
- e. During construction, nearby pervious surfaces and material stockpiles shall be stabilized to prevent sediment from washing onto the surface of the pervious pavement.

2. Maintenance Requirements for All Permeable Pavement System Types

- a. Verify the porous pavement receives no off-site runoff.
- b. Sand or cinders should not be applied for winter traction over the permeable surface as it will clog the system. If applied, the materials must be removed by vacuuming in the spring.
- c. Chloride products used for deicing must not be used on permeable surfaces designed for infiltration, since the salts will be transmitted to the groundwater. Environmentally sensitive deicers are recommended. Permeable surfaces will generally require less salt application than traditional pavements.
- d. Weeds that grow in the permeable pavement shall be sprayed with pesticide. Weeds must not be pulled, as doing so can damage the fill media.
- e. Monthly
 - Ensure that paving area is clean of debris, ensure that paving dewaterers between storms, and ensure that the area is clean of sediments.
- f. Semi-annually
 - Ensure that the porous pavement is protected from clogging due to runoff from landscape areas, rooftops, and other areas that may significantly reduce the long-term permeability by diverting flows away.

g. Annually

- The pervious surface should be vacuumed to restore open permeable pores and lift the sediment or other contaminants out that may reduce the long-term permeability. The frequency of this task shall be increased for areas where overhanging vegetation, excessive dirt, and pollutants are frequent.
- Inspect surface for deterioration. As necessary, repair or replace porous pavement or, for open-jointed block pavement or permeable interlocking concrete pavement, replenish aggregate within the joints.

3. Paver Block Specific Maintenance Requirements

- a. Replace bedding fill material as needed to keep fill level with the paver surface.

4. Grid Paver System Specific Maintenance Requirements

- a. If turf grass is used it shall be maintained at a height at or below 3 inches.
- b. Vegetated areas shall be inspected annually for erosion and scour.
- c. Replace bedding fill material as needed to keep fill level with the paver surface.

H. Design Example

A portion of the parking lot of a commercial site is to be converted to permeable pavement (outlined in blue below). It is assumed that the permeable pavement will retain 100% of WQV for the area it covers (outlined in red below). If the total parking lot area measured is 97,325 ft², including 6,380 ft² of pervious vegetated areas outlined in green below, and 39,410 ft² of this area is to be converted to permeable pavement, determine the resulting reduction in the WQV.



Figure 7003-25: Permeable Pavement Example

Step 1: Calculate the total WQV for the measured portion of the parking lot using **Equations 1 and 2**

Total parking lot area=97,325 ft²

Vegetated area=6,380 ft²

$$WQV = \frac{1.0 * R_v * A_C}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0 * (0.05 + 0.009(93.44\%)) * 97,325 \text{ ft}^2}{12}$$

$$WQV = 7,227 \text{ ft}^3$$

Step 2: Calculate the new WQV given the addition of the permeable pavement

$$WQV = \frac{1.0 * (0.05 + 0.009(93.44\%)) * (97,325 \text{ ft}^2 - 39,410 \text{ ft}^2)}{12}$$

$$WQV = 4,300 \text{ ft}^3$$

The percent reduction in the WQV can be calculated as

$$\%Reduction = \left(\frac{7,227 \text{ ft}^3 - 4,300 \text{ ft}^3}{7,227 \text{ ft}^3} \right) * 100$$

$$\%Reduction = 40.5\%$$

7003.7 Bioswales

A. Introduction

A bioswale, also referred to as vegetated or enhanced swales, is a conveyance channel engineered to capture and treat the water quality volume for a given drainage area. Bioswales are designed with limited longitudinal slopes to force a slow and shallow flow, thus allowing for particulates to settle while limiting the effects of erosion. Berms and/ or check dams installed perpendicular to the flow path promote settling and infiltration.

The bioswale is a vegetated conveyance channel designed to include a filter bed of prepared soil that may overlay an underdrain system. Bioswales are sized to allow the entire WQV to be filtered or infiltrated through the bottom of the swale. Because they are dry most of the time, they are often the preferred option in residential settings.

Bioswales are not to be confused with a filter strip or grass channel. Ordinary grass channels are not engineered to provide the same treatment capability as a well-designed dry swale with filter media. Filter strips are designed to accommodate overland flow rather than channelized flow.

B. Bioswales are primarily applicable to residential and institutional areas of low to moderate density where the impervious cover in the contributing drainage area is relatively small, and along roads and highways.

C. Design Criteria

1. Bioswales shall drain completely within 48 hours of a storm, but no less than 24 hours.
2. Bioswales shall convey the 100-year storm event with a minimum of 6 inches of freeboard.
3. The peak velocity for the 2-year storm must be non-erosive for the soil and vegetative cover provided.
4. Design velocity shall not exceed 0.9 ft/s
5. Design Equations

- a. Storage capacity without underdrain

$$S = A_{BSW} \left(D_0 + \frac{I}{12 \frac{\text{in}}{\text{ft}}} (4 \text{ hr}) \right) \quad (22)$$

Where,

A_{BRC} =bioretention cell area (ft²)

D_0 =ponding depth (ft)

I =Infiltration rate of the bioretention media (in/hr)

4 hr=4 hours worth of drawdown time towards WQV (hr)

b. Storage capacity with underdrain

$$S = A_{BSW} (D_0 + (d_m - d_{rab} - D_u) \phi_{BRC} + (d_{rab} + D_u)) + \left(\frac{\pi D_u^2}{4} L_u \right) (1 - \phi_{BRC}) \quad (23)$$

Where,

A_{BSW} =bioswale cell area (ft²)

D_0 =ponding depth (ft)

d_m =media depth (ft)

d_{rab} =combined depth of rock above and below underdrain (ft)

D_u =underdrain diameter (ft)

ϕ_{BRC} =bioretention cell media porosity

L_u =underdrain length (ft)

c. Maximum ponding depth

$$D_0 = \frac{I(24 \text{ hr})}{12} \quad (24)$$

d. Depth of media

$$D_m = \frac{I(4 \text{ hr})}{\phi_{BSW}} \quad (25)$$

e. Orifice outlet pipe diameter

$$\phi_o = \sqrt{\frac{8A_{BRC}}{\pi C_d t_d} \left(\frac{h_{actual}}{2g} \right)^{0.25}} \quad (26)$$

D_o =diameter for a circular orifice (ft)

A_{BRC} =bioretention cell horizontal area (ft²)

C_d =discharge coefficient that is assumed to be 0.61 for a sharp edge orifice

t_d =design detention time (sec)

h_{actual} =actual height within the bioretention cell that is available for discharge (ft)

$g=32.2 \text{ ft/sec}^2$

6. Swale Shape

a. Swales shall have a parabolic or trapezoidal cross-section.

- b. Swales shall have a bottom width of 2 to 8 feet to achieve adequate filtration.
- c. Depth of the storage volume at the downstream end shall not exceed 18 inches.
- d. A 12-inch average swale depth shall be maintained.
- e. Side slopes shall be no greater than 3H:1V
 - 4H:1V side slopes are recommended.
- f. Channel Slope shall be no greater than 4%.
 - Channel slopes are recommended to be between 1% and 2% unless the topography necessitates a steeper slope.
 - A 6 to 12-inch drop structure can be placed to limit the slope to remain in the recommended 1 to 2% range.
- g. Drop structures shall be spaced at least 50 feet apart.
- h. Energy dissipation is required below the drops.
- i. Wider channels shall contain berms, walls, or a multi-level cross section to prevent channel braiding or uncontrolled sub-channel formation.

7. Project Site

- a. Drainage area shall be no larger than 5 acres.
- b. Minimum elevation difference between inflow and outflow shall be no less than 3 feet.
- c. There shall be at least 2 feet between the bottom of a swale and the elevation of the seasonally high water table.
- d. Exfiltration is prohibited in hotspot areas.

8. Pretreatment

- a. Pretreatment shall be provided by a sediment forebay located at the inlet of the bioswale.
- b. The pretreatment volume shall equal 0.1 inches per impervious acre of drainage area.
- c. The storage volume can be created by implementing one or more check dams at pipe inlets.
- d. Swale systems receiving direct concentrated runoff may have a flow spreader at the upstream end of the control.
- e. See **Section 7003.1** Vegetated Filter Strip for flow spreader requirements.

9. Filter Media

- a. The soil media should comply with the specifications in **2105** and shall have an infiltration rate between 1 and 1.5 feet per day and be at least 18" deep.
- Underdrain
 - There shall be a permeable soil layer 30" in depth above the underdrain.
 - An underdrain collection system shall be equipped with at least a 4-inch diameter perforated PVC pipe (AASHTO M 252) longitudinal underdrain in a gravel layer.
 - A permeable geotextile shall be placed between the gravel layer and the overlying soil.

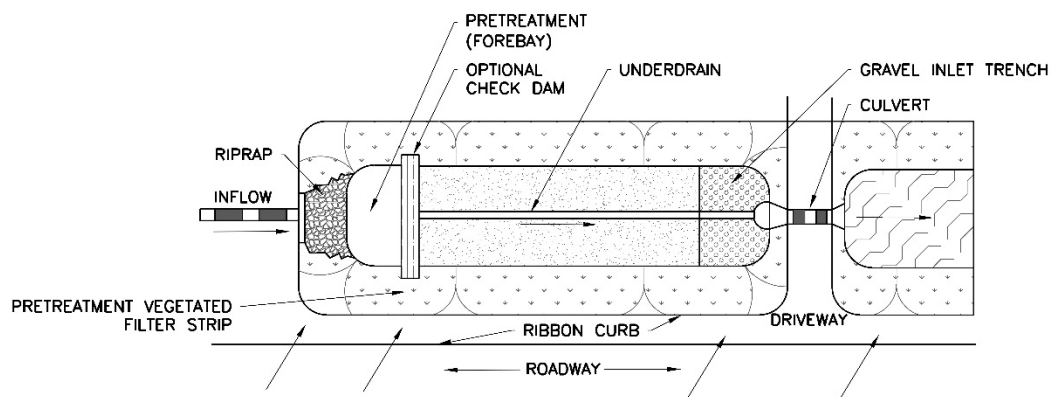


Figure 7003-26: Bioswale Plan View

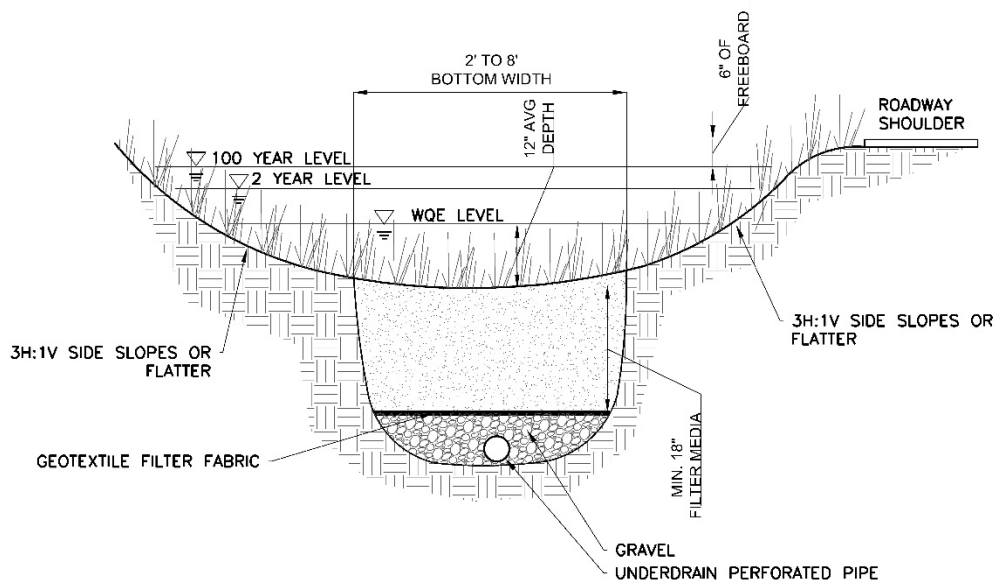


Figure 7003-27: Bioswale Cross-Section

b. Vegetation

- The maximum height of a mature plant within 30 feet of an intersection (measured from the edge of the intersecting road) shall not exceed 24 inches.
- Vegetation at driveways and midblock crossings shall not exceed 24 inches for visibility.
- Refer to Section B of Appendix F of Zoning Ordinance, Trees and Plants for Oklahoma City, 2016, and/or OSU Extension's Plant Selections for Oklahoma for native allowed sodding.

D. Construction and Maintenance Requirements

1. Construction

- a. Construction equipment shall be restricted from the swale area to prevent compaction of the soil.
- b. The bottom of the excavated trench for the swale shall not be loaded in a way that causes soil compaction.
- c. The trench shall be scarified before the gravel and permeable soil are placed.
- d. The sides of the channel shall be trimmed of all large roots.
- e. The sidewalls shall be uniform with no voids and shall be scarified prior to backfilling.
- f. A vegetative cover shall be established over the contributing pervious drainage area before runoff can be accepted into the facility to prevent the pores of the plant media from clogging.

2. Maintenance

- a. Grass heights shall be mowed and maintained at a height of 4 to 6 inches.
- b. Sediment shall be removed from the forebay and channel.

E. Design Example

Two examples at the grocery store are presented below. For each example, design a bioswale to treat the WQV for this contributing area. The examples are as follows:

1. Sandy loam soil with an infiltration rate of 2.0 in/hr. Depth of water table and restrictive layers is greater than 6 ft.
2. Clay soil with an infiltration rate of 0.25 in/hr. Depth of water table and restrictive layers is greater than 6 ft.

For these examples the bioswale will be located in the parking lot and designed to capture a portion of rainfall from the roof and parking lot (**Figure 7003-28**). Values in the examples are estimated or assumed measured values. The actual design should use field site measured data collected by trained professionals.



Figure 7003-28: Bioswale Example

The storage provided by the bioswale should be greater than or equal to the water quality volume (WQV) calculated below using **Equations 1 and 2**.

$$WQV = \frac{D_s * R_v * A}{12}$$

$$R_v = 0.05 + 0.009I(\%)$$

$$WQV = \frac{1.0(0.05 + 0.009(98.40\%)) * 79,700 \text{ ft}^2}{12}$$

$$WQV = 6,214 \text{ ft}^3$$

Example 1:

Step 1: Determine size and type of contributing area.

Total impervious area=79,700 ft²

Step 2: Determine infiltration rate.

For this example, the infiltration rate of the native soil was measured to be 2.0 in/hr.

$I=2.0$ in/hr

Step 3: Select ponding depth.

The maximum ponding depth, D_0 , is calculated using [Equation 24](#).

$$D_0 = \frac{I(24 \text{ hr})}{12}$$

$$D_0 = \frac{(2.0 \frac{\text{in}}{\text{hr}})(24 \text{ hr})}{12 \frac{\text{in}}{\text{ft}}}$$

$$D_0 = 4 \text{ ft}$$

Step 4: Verify the drawdown time.

Bioswales shall drain completely within 48 hours of a storm, but no less than 24 hours. The total drawdown time is calculated using [Equation 19](#)

$$t_{dd} = \frac{12D_0}{I} + 4 \text{ hr}$$

$$t_{dd} = \frac{12(4 \text{ ft})}{2 \frac{\text{in}}{\text{hr}}} + 4 \text{ hr}$$

$$t_{dd} = 28 \text{ hr}$$

Step 5: Site selection.

Manually select area and depth then confirm design meets WQV.

Chosen spot: area in parking lot

Storage capacity without an underdrain is calculated using [Equation 22](#) below.

$$S = A_{BSW} \left(D_0 + \frac{I}{12 \frac{\text{in}}{\text{ft}}} (4 \text{ hr}) \right)$$

Where,

A_{BSW} =bioswale cell area (ft²)

D_0 =ponding depth (ft)

I =Infiltration rate of the bioretention media (in/hr)

4 hr=time that is utilized media storage calculation

Proposed bioswale area=4,295 ft²

$$S = 4,295 \text{ ft}^2 \left(4.0 \text{ ft} + \frac{2 \frac{\text{in}}{\text{hr}}}{12 \frac{\text{in}}{\text{ft}}} (4 \text{ hr}) \right)$$

$$S = 20,043 \text{ ft}^3$$

$$S = 20,043 \text{ ft}^3 > 6,214 \text{ ft}^3 = WQV$$

Design is valid. Proposed bioswale area can be decreased if needed.

Example 2:

Step 1: Determine size and type of contributing area.

Impervious surfaces:

Total impervious area=79,700 ft²

Step 2: Determine infiltration rate.

For this example, the infiltration rate of the native soil was measured to be 0.25 in/hr.

I=0.25 in/hr

Step 3: Manually select ponding depth.

The maximum ponding depth, D_0 , is calculated using [Equation 24](#)

$$D_0 = \frac{I(24 \text{ hr})}{12}$$

$$D_0 = \frac{(0.25 \frac{\text{in}}{\text{hr}})(24 \text{ hr})}{12 \frac{\text{in}}{\text{ft}}}$$

$$D_0 = 0.5 \text{ ft}$$

Step 4: Verify the drawdown time.

Bioswales shall drain completely within 48 hours of a storm, but no less than 24 hours. The total drawdown time is calculated using [Equation 19](#)

$$t_{dd} = \frac{12D_0}{I} + 4 \text{ hr}$$

$$t_{dd} = \frac{12(0.5 \text{ ft})}{0.5 \frac{\text{in}}{\text{hr}}} + 4 \text{ hr}$$

$$t_{dd} = 16 \text{ hr} < 24 \text{ hrs}$$

Design is not valid. Repeat the design process using a deeper media section and include an underdrain.

Example 2 with Underdrain:

Step 1: Determine size and type of contributing area.

Impervious surfaces:

Total impervious area=79,700 ft²

Step 2: Determine infiltration rate.

The infiltration rate of the native soil was measured to be 0.5 in/hr. This low infiltration rate is not suitable for a native media design, therefore a 4-in diameter underdrain pipe will be installed. Assume the installation of the underdrain will result in an infiltration rate of 1.0 in/hr where the implemented design media has a porosity of 0.3.

$I=1.0$ in/hr

Step 3: Manually select ponding depth.

The maximum ponding depth, D_0 , is calculated using **Equation 24**

$$D_0 = \frac{I(24 \text{ hr})}{12}$$

$$D_0 = \frac{(1.0 \frac{\text{in}}{\text{hr}})(24 \text{ hr})}{12 \frac{\text{in}}{\text{ft}}}$$

$$D_0 = 2 \text{ ft}$$

Step 4: Verify the drawdown time.

Bioswales shall drain completely within 48 hours of a storm, but no less than 24 hours. The total drawdown time is calculated using **Equation 19**

$$t_{dd} = \frac{12D_0}{I} + 4 \text{ hr}$$

$$t_{dd} = \frac{12(2.0 \text{ ft})}{1.0 \frac{\text{in}}{\text{hr}}} + 4 \text{ hr}$$

$$t_{dd} = 28 \text{ hrs}$$

Step 4: Manually select the depth of media using **Equation 25.**

$$D_m = \frac{I(4 \text{ hr})}{\phi_{BMP}}$$

$$D_m = \frac{(1 \frac{\text{in}}{\text{hr}})(4 \text{ hr})}{(0.3)} (\frac{1 \text{ ft}}{12 \text{ in}})$$

$$D_m = 1.1 \text{ ft}$$

Step 5: Site selection.

Manually select area and depth then confirm design meets WQV.

Chosen spot: area in parking lot

Storage capacity with an underdrain is calculated using **Equation 23**

$$S = A_{BSW}(D_0 + (D_m - d_{rab} - D_u)\phi_{BRC} + (d_{rab} + D_u)) + \left(\frac{\pi D_u^2}{4} L_u\right)(1 - \phi_{BRC})$$

$$S = 4,295 \text{ ft}^2 \left(1.0 \text{ ft} + \left(1.1 \text{ ft} - 0.5 \text{ ft} - \frac{4 \text{ in}}{12 \frac{\text{in}}{\text{ft}}}\right)(0.3) + \left(0.5 \text{ ft} + \frac{4 \text{ in}}{12 \frac{\text{in}}{\text{ft}}}\right)\right) \\ + \left(\frac{\pi \left(\frac{4 \text{ in}}{12 \frac{\text{in}}{\text{ft}}}\right)^2}{4}\right)(20 \text{ ft})(1 - 0.3)$$

$$S = 11,155 \text{ ft}^3$$

$$S = 8,219 \text{ ft}^3 > 6,214 \text{ ft}^3 = WQV$$

Design is valid. Proposed bioswale area or media depth can be decreased if needed.

Step 6: Determine the orifice outlet diameter for the underdrain using **Equation 26**.

$$\phi_o = \sqrt{\frac{8A_{BSW}}{\pi C_d t_d} \left(\frac{h_{actual}}{2g}\right)^{0.25}}$$

$$\phi_o = \sqrt{\frac{8(4,295 \text{ ft}^2)}{\pi(0.61)(172,000 \text{ sec})} \left(\frac{2 \text{ ft}}{2(32.2 \frac{\text{ft}}{\text{s}^2})}\right)^{0.25}}$$

$$\phi_o = 0.14 \text{ in}$$

7004 LARGE SCALE CONTROLS

Large scale controls are designed to be at the watershed or neighborhood development scale where all runoff from the site is typically routed to one SCM per drainage area. The contributing area for these SCMs is usually 10 acres or larger.

7004.1 Sedimentation-filtration/biofiltration Basins

A. Introduction

A sedimentation-filtration SCM captures and temporarily stores stormwater runoff and passes it through a filter bed of sand. Most sand filter systems consist of two-chamber structures. The first chamber is a sediment forebay or sedimentation chamber, which removes floatables and heavy sediments. Runoff is discharged from the sedimentation chamber through a perforated standpipe into the filtration chamber, the second chamber. The filtration chamber removes additional pollutants by filtering the runoff through a sand bed. The filtered runoff is typically collected and returned to the conveyance system, though it can also be partially or fully exfiltrated into the surrounding soil in areas with porous soils.

Sedimentation-filtration basins are primarily designed as an off-line system for stormwater quality. They do not provide any runoff reduction, so they will need to be used in conjunction with another stormwater control to provide runoff reduction if necessary.

Biofiltration devices are a type of stormwater control measure that meets or exceeds treatment levels as compared to a standard sedimentation/filtration system. Similarly, stormwater is routed through a sediment forebay; however, in this control measure, flows are then directed through a biofiltration medium which removes pollutants. The biofiltration devices include plants and microorganisms that are rooted in the filter medium and provide more treatment of runoff. It is comparable to a sedimentation-filtration basin except it has a plant community that sustains the permeability of the biofiltration medium for longer periods of times without maintenance.

Full Sedimentation SCMs shall be used when all design criteria can be met. The entire water quality volume can be held in the sedimentation basin. The water from the sedimentation basin slowly discharges runoff to the filtration basin via a perforated riser pipe.

Partial Sedimentation SCMs shall be used when full sedimentation is unfeasible. Unfeasible is considered: assuming (for the purposes of this selection process only) a maximum ponding depth of three feet in the sedimentation basin, if it is not feasible to obtain an outlet for the drainage from the filtration basin within one hundred (100) feet of the crest of the filtration embankment, then the partial sedimentation/filtration configuration system may be used. Assumed smaller filtration rate due to higher

sediment loading and clogging of the filter media. This design foregoes the perforated riser pipe, and distributes the water quality volume between the filtration basin and a sediment chamber. The filtration bed and sediment chamber are separated by a gabion wall or other porous structure.

Biofiltration SCMs shall be used when vegetation within the sedimentation basin is preferred.

B. Design Criteria – Full Sedimentation

1. Basin Surface Areas

For sedimentation and filtration basins, surface area is the primary design parameter for a fixed minimum draw-down time of forty-eight (48) hours.

The following equation gives the minimum surface areas required for the sedimentation and filtration basins:

The filtration basin surface area is calculated as:

$$A_f = \frac{WQV}{(7+2.33H)} \quad (26)$$

Where,

A_f =minimum surface area of the filtration media in square feet

Assumed drawdown time=48 hours

WQV=water quality volume as defined in 7002.1. in cubic feet

H=maximum ponding depth in the filtration basin in feet

The assumed maximum ponding depth of the sand filtration basin should be at least one (1) foot less than the maximum ponding depth in the sedimentation basin.

2. Basin Volumes

The storage capacity of the sedimentation basin shall be greater than or equal to the water quality volume. The design shall allow enough freeboard above the water quality volume to pass the design flow rate for the 100 year storm over the splitter/diversion structure without overtopping of any side walls of the pond, plus an additional 5 percent of the total fill height or 3 inches, whichever is greater, to allow for construction irregularities and long term soil settling.

The storage capacity of the filtration basin, above the surface of the filter media, should be greater than or equal to 20 percent of the water quality volume. This capacity is necessary in order to account for backwater effects resulting from partially clogged filter media.

Any pond embankment configuration meeting the criteria for dam safety requirements must follow the criteria of the Oklahoma Water Resources Board.

3. Sedimentation Basin Details

The sedimentation basin consists of an inlet structure, flow spreader (if inlet structure does not provide flow spreading), settling area and, outlet structure. The sedimentation basin design should maximize the distance from where the heavier sediment is deposited near the inlet to where the outlet structure is located. It is recommended that the bottom of the sedimentation basin (and invert of riser pipe) be ≥ 2 inches higher than the top of the filtration bed.

a. Inlet Structure/Flow Spreader

- Splitter structure to separate water quality volume and discharge uniformly and low velocity to sedimentation basin.
- Drop inlet structure is recommended to facilitate sediment removal and maintenance. Allows for heavier suspended material to drop out near the front of the basin.
- Maximum velocity discharged to the sedimentation basin should not exceed two (2) feet per second. Flow spreader/energy dissipator will likely be necessary at the pipe outfall in order to reduce velocities and distribute flow.

b. Outlet Structure

- Conveys the water quality volume from the sedimentation basin to the filtration basin.
- Designed to provide for a minimum draw-down time of forty-eight (48) hours and maximum of ninety-six (96) hours.
- Riser pipe should be a perforated schedule forty (40) PVC riser pipe with a removable and accessible PVC cap. Drill an orifice in the cap to appropriately design drawdown time. The discharges through the perforations should not be used for draw-down time design purposes.
- The top of the riser should extend above the elevation of the splitter weir or should be fitted with a threaded removable cap.
- A trash rack shall be provided for the riser.

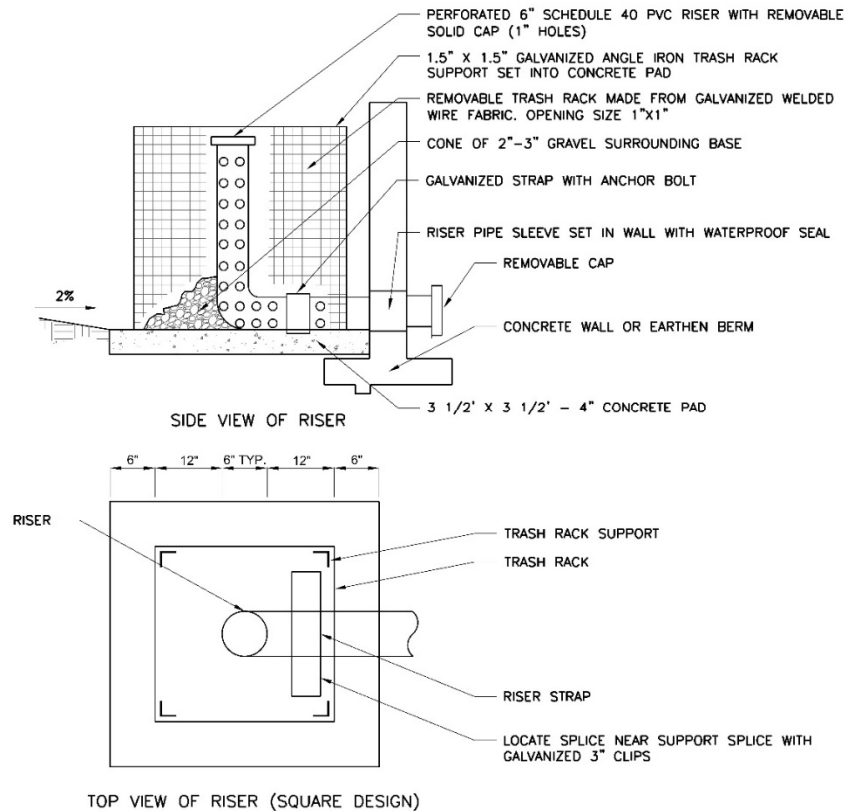


Figure 7004-1: Riser Pipe Diagram

c. Basin Geometry

- The sedimentation basin should have a minimum two (2) percent bottom slope to ensure that the pond will drain adequately even after silt accumulation.
- Water collected in the sediment basin shall be conveyed to the filtration basin to prevent standing water from occurring. The invert of the drainpipe should be above the surface of the filtration sand bed. The minimum grading of the piping to the filtration basin should be two (2) percent slope. Access for cleaning the sediment basin drain system is necessary.

4. Sand Filtration Basin Details

The sand bed filtration system consists of the inlet structure/flow spreader, sand bed, underdrain piping and basin liner.

a. Inlet Structure/Flow Spreader

- Spread the flow uniformly across the surface of the filter media. See Figure 7004-2 for flow spreader design guidance.
- A rock flow spreader is recommended. The rocks directly in the flow path of the riser pipe discharge must be sized

appropriately to prevent scour and erosion. For proper riprap sizing follow the design criteria located in riprap spec.

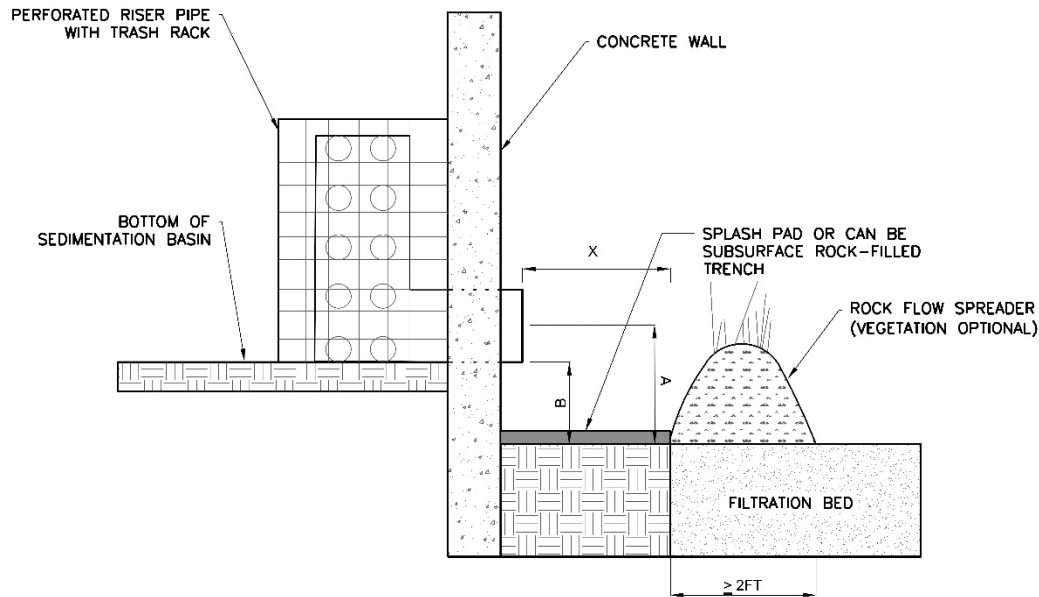


Figure 7004-2: Riser Pipe Outlet System

- Determination of Dimension X, or maximum pipe discharge travel distance:
- Given known riser pipe diameter d, calculate cross-sectional area

$$A_o = \frac{\pi d^2}{4} \quad (27)$$

- Calculate maximum riser pipe discharge Q (cfs) using orifice equation
- Calculate maximum discharge velocity

$$v = \frac{Q}{A_o} \quad (28)$$

- Calculate "fall time" for flow trajectory.

$$t = \sqrt{\frac{2(B+A)}{g}} \quad (29)$$

Where:

t is in seconds

B = Recommended ≥ 2 " differential between bottom of sedimentation basin and top of filter

A = pipe radius including thickness + any gap between riser pipe and pond bottom (ft)

g = gravitational acceleration = 32.2 ft/sec²

- Calculate

$$X \geq 1 + vt \quad (30)$$

1 ft is added for margin of safety

b. Sand Bed

- The sand bed must be built to Figure 7004-3 configuration unless topographic constraints make this design unfeasible.
- The top surface of the sand filter bed must be horizontal, i.e., no grade is allowable.
- Sand bed depths are final, compacted depths.

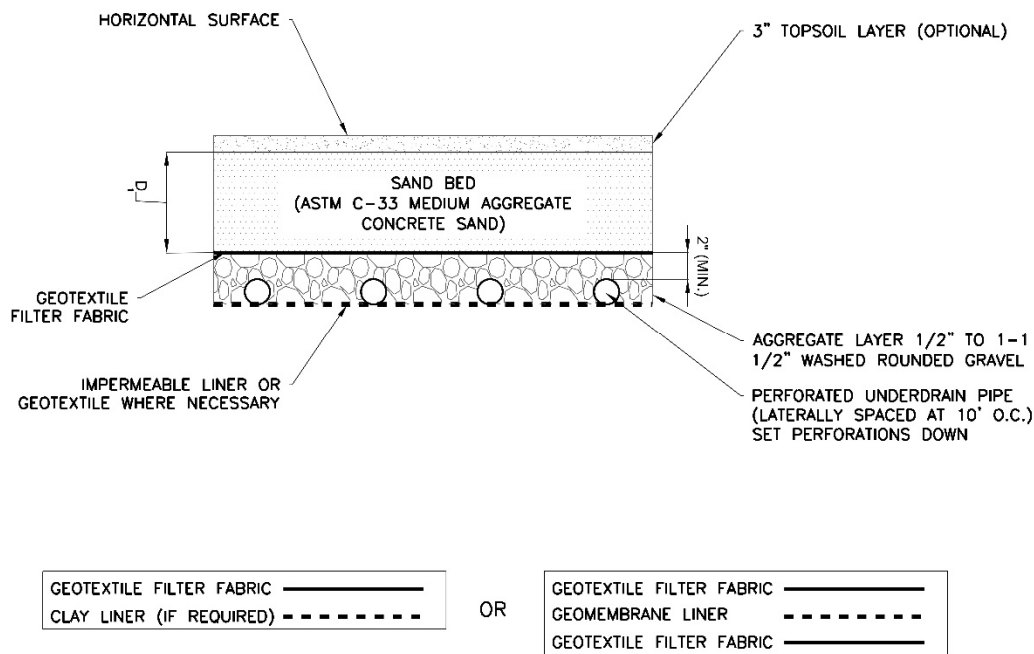


Figure 7004-3: Filtration Bed Cross-Section

c. Underdrain Piping

- The underdrain piping consists of the main collector pipe(s) and perforated lateral branch pipes. The maximum spacing for the laterals should be ten (10) feet between laterals and five (5) feet from a wall or side. The maximum spacing between rows of perforations should not exceed six (6) inches.

- The minimum grade of piping shall be one-eighth (1/8) inch per foot (one (1) percent slope).
- Access for cleaning all underdrain piping is needed. Cleanouts with a removable PVC cap are required within fifty (50) feet of every portion of lateral, at collector drain lines, and at every bend. Set the top of the cleanout flush with the top of the sand bed. At least one lateral must be accessible for cleaning when the pond is full. The full pond cleanout should extend above the water quality elevation and/or be located outside of the water quality volume ponding area. In order to minimize vandalism or other types of damage to this full pond cleanout the use of exposed piping shall be avoided or minimized.

d. Basin Liner

- Impermeable liner requirements and specifications are located in **Section 7002.5**. If basin side slopes will be installed adjacent to roadway, coordinate with professional engineer and construction services to determine appropriate basin section that will not impact integrity of road. Liner may need to be required along side slopes to protect foundations and road bases from seepage.

e. Outfall

- The surface discharge from the underdrain pipe shall be non-erosive. Where feasible the underdrain pipe should discharge to a gravel trench to diffuse the flow and promote infiltration and recharge.
- An emergency or bypass spillway must be included in the surface sand filter to safely pass flows that exceed the design storm flows. The spillway prevents filter water levels from overtopping the embankment and causing structural damage. The emergency spillway should be located so that downstream buildings and structures will not be impacted by spillway discharges.

C. Design Criteria-Partial Sedimentation

1. Basin Surface Areas and Volume

This filtration rate is less than that assumed for the filtration basin in the full sedimentation/filtration system due to higher sediment loading and consequent clogging of the filter media.

The following equation gives the minimum surface area required for the filtration basin:

$$A_f = \frac{WQV}{(4+1.33H)} \quad (31)$$

Where,

A_f =required surface area of the media in square feet

WQV=water quality volume in cubic feet

H=maximum ponding depth above the filtration media in feet

The combined volume of the sediment chamber and filtration basin exclusive of the gabion volume must be equal to the water quality volume, i.e., $V_s + V_f$ = water quality volume where "Vs" is the sediment chamber volume and "Vf" is the filtration basin volume.

The volume of the sediment chamber, " V_s ", shall be a minimum of 20 percent of the water quality volume.

2. Sediment Chamber Detail

The sediment chamber consists of an inlet structure/flow spreader, settling area, and outlet structure. It is recommended that the bottom of the sediment chamber be ≥ 2 inches higher than the top of the filtration bed. The sediment chamber should have a minimum two (2) percent bottom slope to ensure that the pond will drain adequately even after silt accumulation.

a. Inlet Structure/Flow Spreader [see **Section 7004.1B.3.a**]

b. Outlet Structure

- The outlet structure should be a berm or wall with multiple outlet ports or a gabion so as to discharge the flow evenly to the filtration basin. Rock gabions should be constructed using five (5) to eight (8) inch diameter rocks. The berm/wall/gabion height should not exceed six (6) feet and high flows should be allowed to overtop the structure (weir flow). Multiple outlet ports should be used in the berm/wall so as to induce flow-spreading. The outflow side should incorporate features to prevent gouging of the sand media (e.g., concrete splash pad or riprap).
- Any pond embankment configuration meeting the criteria for dam safety requirements must follow the criteria of the Oklahoma Water Resources Board

3. Sand Filtration Basin Details_(see **Section 7004.1B.4**)

See **Figure 7004-2** for flow diffuser outlet detail. In addition, install a removable PVC cap with an appropriately sized orifice at the end of the underdrain pipe in order to provide a forty-eight (48) hour drawdown time, to account for significant uncertainties to the actual filtration media hydraulic conductivity over the life of the system.

D. Design Criteria - Biofiltration

1. Basin Surface Areas and Volumes

a. Full Sedimentation/Biofiltration Systems

- In these systems the entire water quality volume is stored in the sedimentation basin, and then discharges relatively slowly to the biofiltration basin (e.g. over a period of 48 hours). See 7004.1B. for additional design criteria and Figure 7004-4, Full Sedimentation/Biofiltration Pond, for general details. It is recommended that the bottom of the sedimentation basin be $\geq 2"$ higher than the top of the filtration basin.
- Based on the equation and assumptions given above, the minimum surface area required for the biofiltration basin is:

$$A_f = \frac{WQV}{(7+2.33H)} \quad (32)$$

Where,

A_f =filtration area in square feet

WQV = water quality volume in cubic feet as defined in **Section 7002.1**

H = maximum ponding depth in the filtration basin. The assumed maximum ponding depth of the filtration basin should be at least one (1) foot less than the maximum ponding depth in the sedimentation basin, to account for tailwater effects.

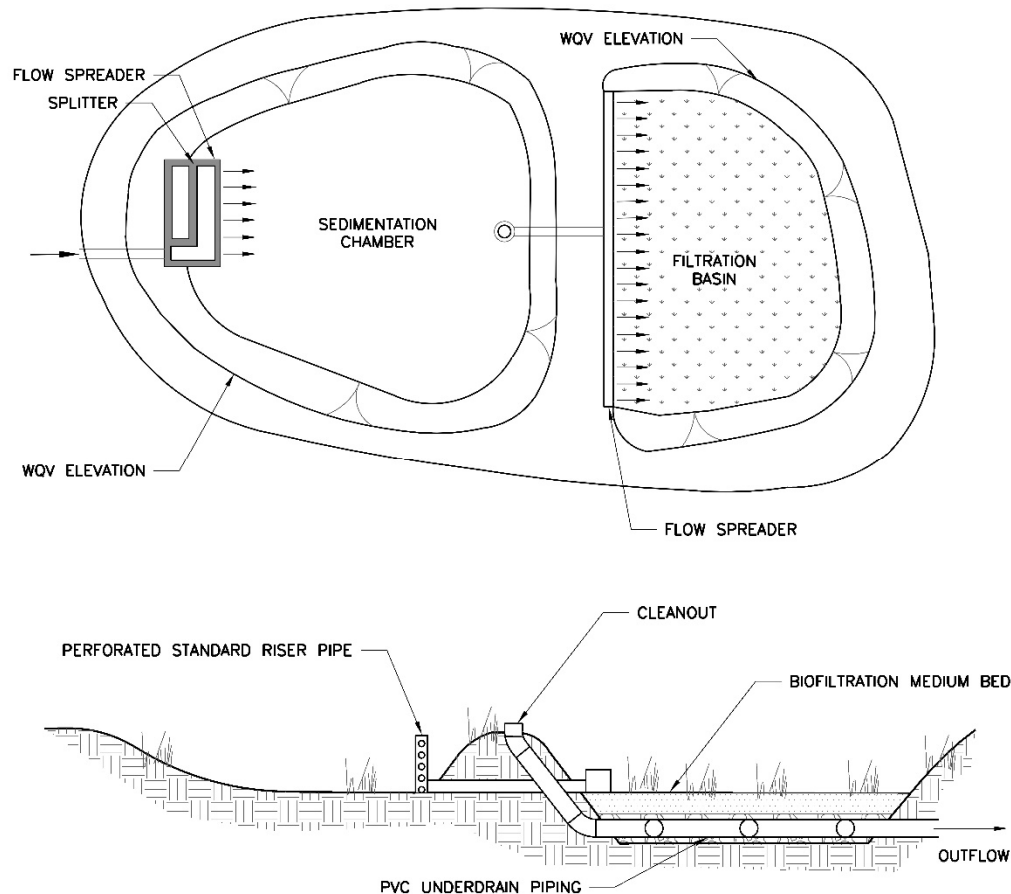


Figure 7004-4: Full Sedimentation/Biofiltration Pond

b. Partial Sedimentation/Biofiltration Systems

- System is considered partial when the sediment chamber is not large enough to store the whole water quality volume, so that volume must be stored partly over the sediment chamber and partly over the biofilter. The combined volume of the sediment chamber and filtration basin must therefore equal to the water quality volume, i.e., $V_s + V_f = \text{water quality volume}$ where " V_s " is the sediment chamber volume and " V_f " is the filtration basin volume. The volume of the sediment chamber, " V_s ", shall be no less than 20 percent of the water quality volume. For general details see Figure 7004-5 Partial Sedimentation/Biofiltration Pond, and **Section 7004.1C**, Partial Sedimentation/Filtration.

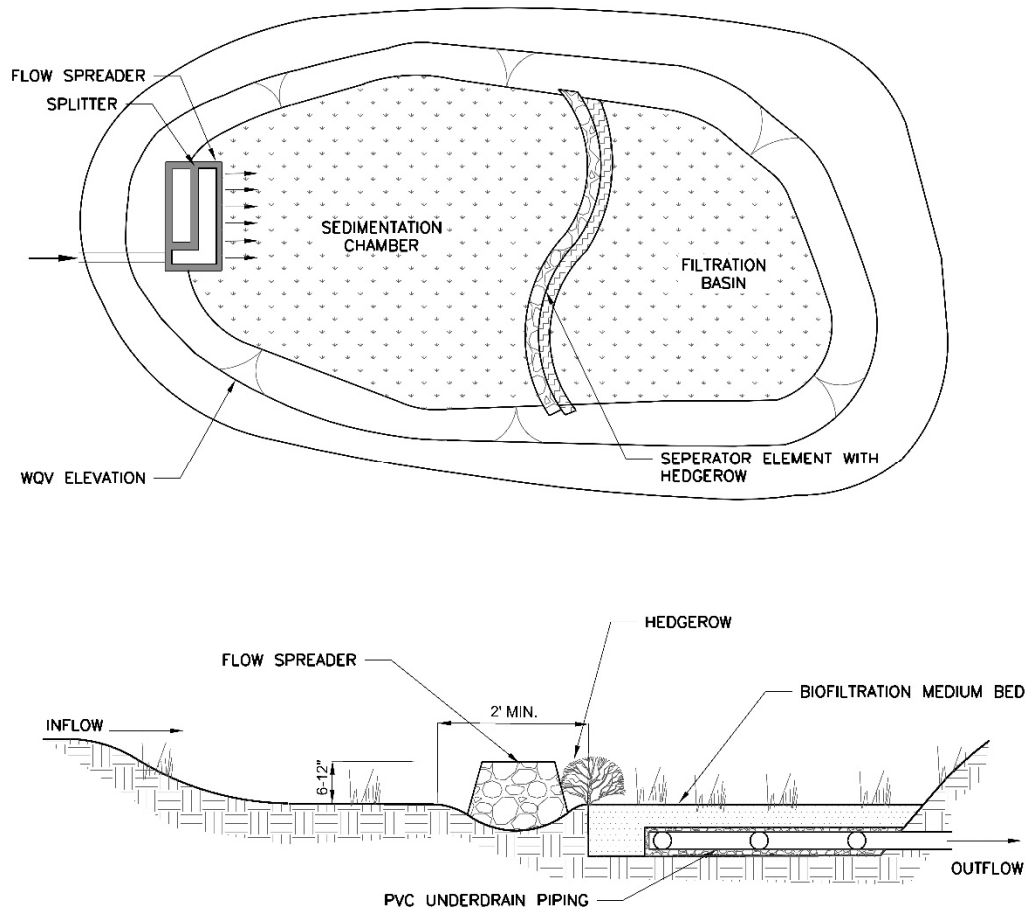


Figure 7004-5: Partial Sedimentation/Biofiltration Pond

- Based on the equation and assumptions given above, the minimum surface area required for the biofiltration basin is:

$$A_{BRC} = \frac{WQV}{(4+1.33H)} \quad (33)$$

Where,

A_{BRC} = required surface area of the medium in square feet,

WQV = water quality volume in cubic feet as defined in **Section 7002.1**

H = maximum ponding depth above the filtration medium in feet.

2. Sedimentation Basin/Sediment Chamber Details

The system consists of an inlet structure, flow spreader, vegetative settling area, and separator element. It is recommended that the bottom of the sediment chamber be >2" higher than the top of the filtration basin to uniformly discharge flow at or above the biofiltration vegetation,

and to prevent excessive drawdown times due to tailwater effects.

a. Inlet Structure/Flow Spreader

- The inflow should pass through a splitter box structure or flow spreading device. Flow spreading should be designed to restore the flows entering the SCM (i.e., after the inlet structure) to sheet flow conditions with a maximum velocity of two (2) feet per second for the peak flow rate of the twenty-five (25) year storm.
- Plantings in the sedimentation basin may provide resistance to flow and further spread the flows, thereby reducing runoff velocities further to improve settling, biological uptake, and adsorption.
- The basin should have a bottom slope of at least 2% to ensure that the pond will drain adequately even after silt accumulation.

b. Separator Element

- Designed to discharge the flow evenly across the filtration basin. This is important to avoid channelizing and destruction of the filtration medium surface. A reinforced vegetated hedgerow is recommended that uses five (5) inch by eight (8) inch rock flow spreaders or low gabion structures, two (2) feet wide and six (6) inches to twelve (12) inches deep, with hedgerows located within the structure.
- The outflow side should incorporate features to prevent gouging of the filtration medium.

3. Biofiltration Basin Details

The Biofiltration medium bed filtration system consists of the biofiltration medium bed, underdrain piping, and outlet structure.

a. Biofiltration Bed with Underdrain

- The biofiltration medium layer is to be a minimum of eighteen (18) inches meeting the specifications stated in **Specification 2105**. Required biofiltration medium bed depths should be interpreted as final consolidated values rather than as initially placed.
- Under the biofiltration medium shall be an underdrain system that consists of one-half (0.5) to one and one-half (1.5) inch diameter washed, rounded, river gravel surrounding 6 inch Schedule 40 PVC underdrain lateral pipes. The maximum spacing for the laterals should be ten (10) feet between laterals and five (5) feet from a wall or side. The minimum thickness of the gravel envelope is 3 inches. The soil

medium and gravel layer must be separated by a filter material.

- A filter can be of two (2) general forms. A fabric filter is a layer of geotextile and a granular filter is one or more graded layers of sand, gravel or stone. The geotextile filter fabric must comply with the criteria in the riprap **Specification 2200**. The gradation of a granular filter design must comply with Federal Highway Administration "Geosynthetic Design and Construction Guidelines" (FHWA-HI-95-038). In cases where the requirements cannot be met with a single gradation, multiple layers of granular filter material of varying gradations may be required to meet the criteria. The thickness of a granular filter layer should be no less than 1.5 times the maximum size in the filter gradation or four inches (102 mm) whichever is greater.

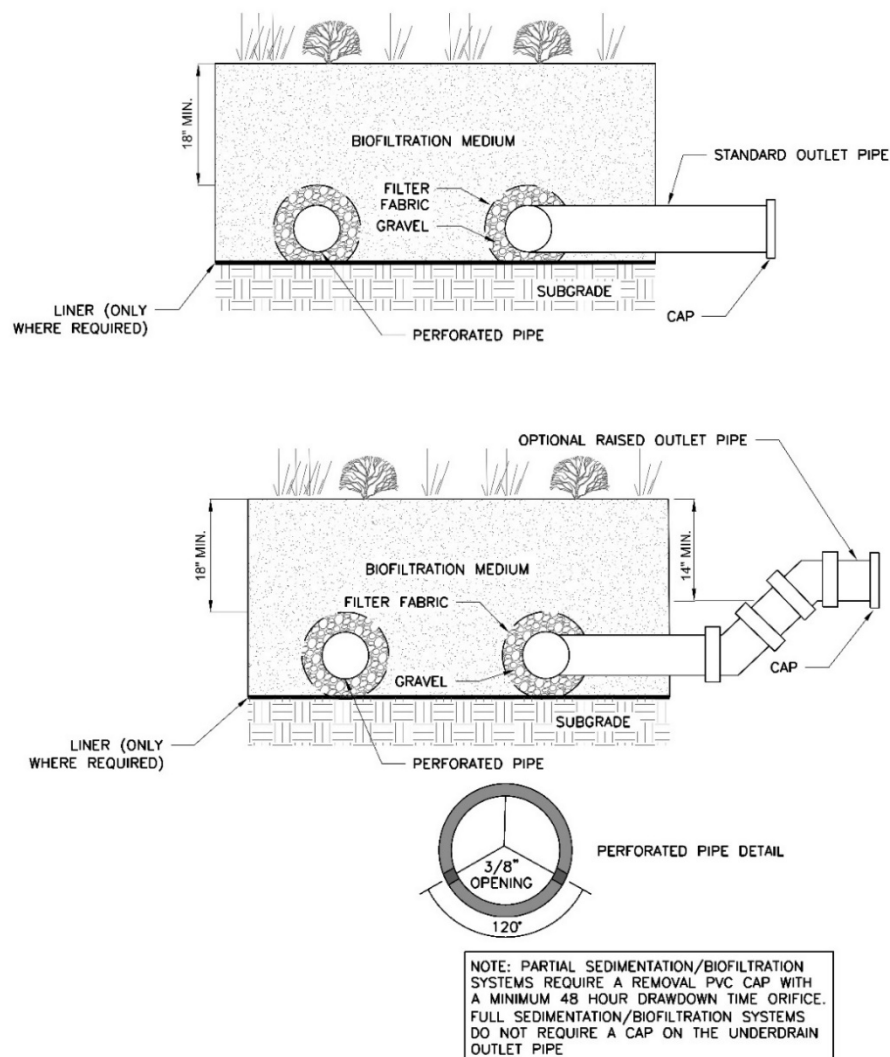


Figure 7004-6: Biofiltration Medium Bed with Underdrain System

- Access must be provided for cleaning all underdrain piping. Cleanouts with a removable PVC cap are required within fifty (50) feet of every portion of lateral, at collector drain lines, and at every bend. Top of the cleanout should be set flush with the top of the biofiltration medium bed or ground surface from which it emerges. It is recommended that cleanouts be located outside of the water quality volume ponding area and above the water quality volume elevation when feasible to reduce short circuiting caused by loss or damage to the cleanout caps. At least one lateral must be accessible for cleaning when the pond is full. The full pond cleanout must extend above the water quality elevation and/or be located outside of the water quality volume ponding area. To minimize vandalism or other types of damage, the use of exposed piping shall be avoided or minimized.
- The top surface of the biofiltration medium bed must be horizontal.

b. Outlet Structure

- The outlet structure shall be designed in accordance with design criteria for Sedimentation/Filtration Systems but may also include a raised outlet to create a saturated zone within the underdrain gravel area and part of the biofiltration medium. The advantages of a raised outlet are that the retained water is partially available to support plants in the filtration basin during extended dry periods and it reduces the total headloss across the system.
- The surface discharge from the underdrain pipe shall be non-erosive. A splash pad or other dissipation system may be necessary. Unless site conditions make it impossible, the underdrain pipe should discharge to a gravel trench in order to diffuse the discharge flow and promote infiltration and recharge.

4. Landscape Design

A diverse suite of plants should be selected based on their ability to survive under alternating conditions of inundation and extended dry periods, and in different areas within a facility (e.g., basin versus side slopes). High plant diversity will provide resiliency to the system and help prevent a situation where all vegetation is lost. Over time, the plant species that are best suited to the unique conditions of each basin will naturally self-select and spread.

The landscape elements for the sedimentation basin may be different than for the biofiltration basin, due primarily to different soil characteristics. Compared to most native soils in the Norman area, the biofiltration medium may drain more rapidly, and have less clay content.

The selection of plants for the biofiltration medium depth will also be limited because the medium depth is typically about 18-inches, thus plants with large root systems are not appropriate. Trees shall not be used in the biofiltration chamber with underdrains. The soil characteristics and depth, and soil moisture availability including groundwater, in the sedimentation basin or chamber will probably vary widely from site-to-site, and this will have a significant effect on the plant selection.

To lessen maintenance requirements, the designer has the option to specify native sod for the biofiltration basin as well, but the pollutant removal potential will be reduced due to the reduction in biological uptake in the root system.

a. Plant Selection, Quantities, and Spacing

- Vegetation shall be planted throughout the entire sedimentation and filtration basin areas as shown on a planting plan along with list of proposed plant species, container size, spacing, and quantity. The proposed vegetation must be diverse, appropriately distributed, and spaced according to the mature size of the particular plants. A landscape architect or other qualified landscape professional should be involved in the design to ensure appropriate plant species selection and layout.
- Minimum of five (5) different species planted covering 95% of basins surface areas. Annuals are not permitted. The designer can choose native plants from Section B of Appendix F of Zoning Ordinance, Trees and Plants for Oklahoma City, 2016, and/or OSU Extension's Plant Selections for Oklahoma.
- Small trees can be incorporated in the filtration basin, around the perimeter of the filtration basin, above the water quality volume, as long as the underdrain system is protected from penetration by the tree root system.
- Small trees can be incorporated in the sedimentation basin, in the floor and side slopes within the water quality volume, if soil conditions and depth are appropriate, and measures are taken to prevent root penetration into the adjacent filtration underdrain system.
- Plants must be selected and arranged carefully so that they serve their intended functions. In addition to choosing plants for their aesthetic properties, select plants that:
 - Are adapted to the pond hydrology (i.e. both periodic flooding and drought).

- Are adapted to the soil types within the pond, whether native site soils or biofiltration media.
- Are suitable for their specific function (e.g. erosion control, filtration, etc.).
- Are durable, resilient and resistant to pests and disease.
- Are tolerant of the pollution in stormwater runoff.
- Have a root system of the desired type, mass and depth.
- Are resistant to weed invasion.
- Require minimal maintenance.
- Are not invasive.
- Are commercially available.

b. Sedimentation Basin

- To determine the minimum required quantity of rooted plants, multiply the total surface area (in square feet) of the sedimentation basin by ten percent (0.1). This number represents the minimum number of plants to be placed in the sedimentation basin.

c. Filtration Basin

- To determine the minimum required quantity of rooted plants, except turf grass, multiply the total surface area (in square feet) of the filtration basin by twenty percent (0.2). This number represents the minimum number of rooted plants to be placed in the filtration basin.

E. Construction and Maintenance Requirements

1. Construction

- a.** Review design with contractor in the field. Go over importance of hitting elevations, function of inlet location(s), and meeting specs on material.
- b.** Restrict and/or limit vehicular and foot traffic around infiltration basin areas.
- c.** Install as close to the end of construction as possible.
- d.** Off-line construction is preferred.
- e.** Keep sediment out of the infiltration device as much as practical.
- f.** Clearly mark infiltration areas before work begins to avoid soil compaction or sedimentation to preserve infiltration capacity.

- g. Scarify subgrade before installing fill to loosen up native soil to promote infiltration.
- h. Once area has been excavated, extremely important to move straight into filling with biofiltration media to avoid leaving materials along roadways exposed to weather conditions, which will promote cracking and slides.
- i. Specify in technical specs that a design survey shall be completed to confirm inlet elevations, slope of facility, outlet pipes, pond depths, overflow elevations, etc. Consider showing in the detail which locations should be surveyed. Outline allowable tolerance.
- j. Inspect materials (plants, double washed gravel, media) upon delivery to the site but before install to verify it meets specs. Check watertight seals at HDPE and PVC connections.
- k. Specify construction sequence in construction docs.

2. Maintenance

- a. For biofiltration basins only: unless damaged by unusual sediment loads, high flows, or vandalism, the biofiltration media should be left undisturbed and allowed to age naturally, and biofiltration pond vegetation shall be managed so that a dense, healthy vegetative cover is preserved.
- b. As needed
 - Inspect for clogging – rake first inch of sand.
 - Remove sediment from forebay and chamber.
 - Replace sand filter media.
 - Inspect after large rainstorm.
 - Keep drainage paths clean.
 - Replace media if filter becomes clogged or over-compacted.
- c. Bi-weekly during first growing season
 - Inspect vegetation until 95% vegetative cover is established (if applicable).
- d. Monthly
 - Check to see that the filter bed is clean of sediment, and the sediment chamber is not more than 50% full or 6 inches, whichever is less, of sediment. Remove sediment as necessary.
 - Make sure that there is no evidence of deterioration, spalling or cracking of concrete.
 - Inspect trash rack.

- Inspect inlets, outlets and overflow spillway to ensure good condition and no evidence of erosion.
 - Repair or replace any damaged structural parts.
 - Stabilize any eroded areas.
 - Ensure that flow is not bypassing the SCM.
 - Ensure that no noticeable odors are detected outside the SCM.
- e. As needed or 4 times during growing season
- Ensure that contributing area, sand filter, inlets and outlets are clear of debris.
 - Weed (if applicable).
 - Ensure that contributing area is stabilized.
 - Ensure that activities in the drainage area minimize oil/grease and sediment entry to the system.
 - Replace soil media in void areas caused by settlement; repair eroded areas; re-mulch by hand any void areas (if applicable).
- f. Semi-annually
- Remove and replace dead or diseased vegetation that is considered beyond treatment; treat all diseased trees and shrubs mechanically or by hand depending on the insect or disease infestation (if applicable).
 - If drawdown exceeds criteria, lightly scarify soil with hand cultivator.
 - If standing water remains for greater than 96 hours, remove top layer of sediment, mulch and potentially revegetate (if applicable).
 - De-compact soil by scarification and replace mulch and disturbed vegetation (if applicable).
- g. Yearly
- If clogged, remove the top few inches of the sand, roto-till or otherwise cultivate the surface, and replace media with sand meeting the design specs.
 - Replace any geotextile that has become clogged.
- h. Every 3-5 years
- *Remove and replace the top 2-3 inches of sand in the filter.*

3. Design Example

Design a biofiltration basin in the 55,638 ft² area outlined in red below where the drainage area is 31.2 acres. Calculate dimensions of the basin and ponding depth required to hold the WQV.

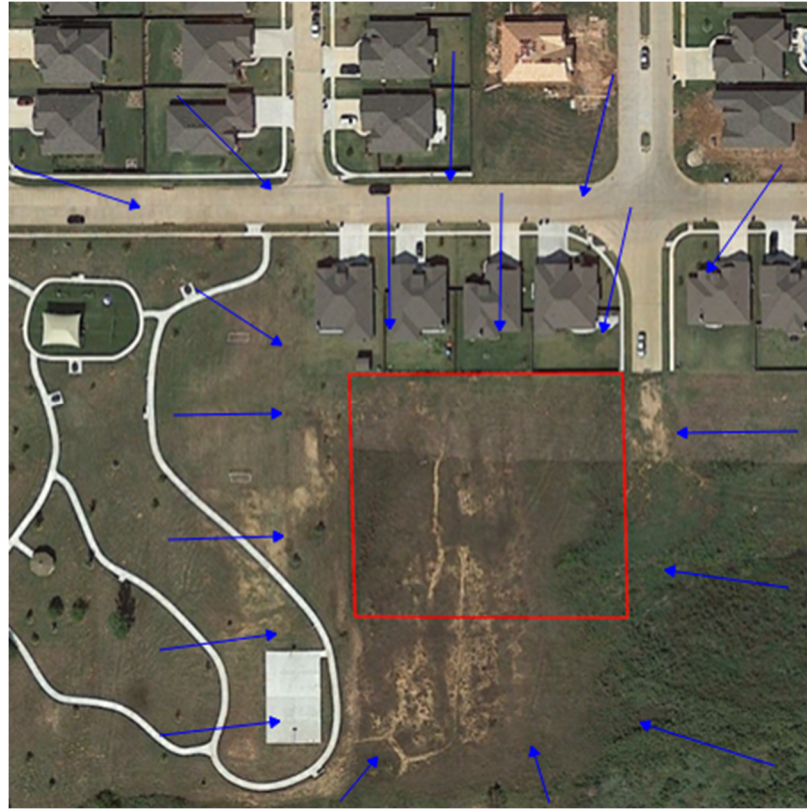


Figure 7004-7: Sedimentation-Filtration Example

Example 1: Full Sedimentation

Drainage area=31.2 acres

The water quality volume is calculated using **Equations 1 and 2**.

$$WQV = \frac{D_s * R_v * A}{12}$$

$$R_v = 0.05 + 0.009I$$

$$WQV = \frac{(1.0) * (0.05 + 0.009(45\%)) * (31.2)}{12}$$

$$WQV = 1.18 \text{ acre} - ft = 51,401 \text{ ft}^3$$

Calculate the minimum surface area of filtration media required using **Equation 32**. Assume a maximum ponding depth of 4 feet.

$$A_f = \frac{WQV}{(7 + 2.33H)}$$

$$A_f = \frac{1.180 \text{ acre} - ft}{(7 + 2.33(4 \text{ ft}))}$$

$$A_f = 0.072 \text{ acre} = 3,136 \text{ ft}^2$$

In accordance with $L:W \geq 2$ for a sedimentation basin, assume a rectangular sedimentation basin containing 20% of the WQV.

$$V = H * L * W; L = 2W; V = H * 2W^2; 20\% * WQV = 2W^2 * H$$

$$W = \sqrt{\frac{20\% * 51,401 \text{ ft}^3}{4 \text{ ft} * 2}}$$

$$W = 35.8 \text{ ft}; L = 71.6 \text{ ft}$$

Assume a rectangular filtration basin has the same width as sedimentation basin and $L:W \geq 1$ and depth of 4.5 ft.

$$WVQ = L * W * D$$

$$L = \frac{51,401 \text{ ft}^3}{35.8 \text{ ft} * 4.5 \text{ ft}}$$

$$L = 320 \text{ ft}$$

Example 2: Partial Sedimentation

Drainage area=31.2 acres

The water quality volume is calculated using [Equations 1 and 2](#).

$$WQV = \frac{D_s * R_v * A}{12}$$

$$R_v = 0.05 + 0.009I$$

$$WQV = \frac{(1.0) * (0.05 + 0.009(45\%)) * (31.2)}{12}$$

$$WQV = 1.18 \text{ acre} - ft = 51,401 \text{ ft}^3$$

Calculate the minimum surface area of filtration media required using [Equation 31](#). Assume a maximum ponding depth of 4 feet.

$$A_f = \frac{WQV}{(4 + 1.33H)}$$

$$A_f = \frac{1.180 \text{ acre} - ft}{(4 + 1.33(4 \text{ ft}))}$$

$$A_f = 0.127 \text{ acre} = 5,532 \text{ ft}^2$$

In accordance with $L:W \geq 1$ for a sedimentation basin, assume a square sedimentation basin containing 20% of the WQV.

$$V = H * L * W; L = W; V = H * W^2; 20\% * WQV = W^2 * H$$

$$W = \sqrt{\frac{20\% * 51,401 \text{ ft}^3}{4 \text{ ft}}}$$

$$W = 50.7 \text{ ft}; L = 50.7 \text{ ft}$$

Assume a rectangular filtration basin has the same width as sedimentation basin and $L:W \geq 2$ and depth of 4.5 ft.

$$WVQ = V_s + V_f$$

$$V_f = WQV - (20\% * WQV)$$

$$V_f = 80\% * WQV$$

$$W * L * H = 80\% * 51,401 \text{ ft}^3$$

$$L = \frac{80\% * 51,401 \text{ ft}^3}{50.7 \text{ ft} * 4.5 \text{ ft}}$$

$$L = 180.2 \text{ ft}$$

7004.2 Extended Detention Basin

A. Introduction

An extended detention (ED) basin is a surface storage basin or facility designed to provide water quality treatment and water quantity control through extended detention of stormwater runoff. Dry ED basins differ from dry detention basins in that they provide 48-hour detention of the water quality volume. It has an outlet structure that detains and attenuates runoff inflows and promotes the settlement of pollutants. The facility normally remains dry between storm events.

B. Design Criteria

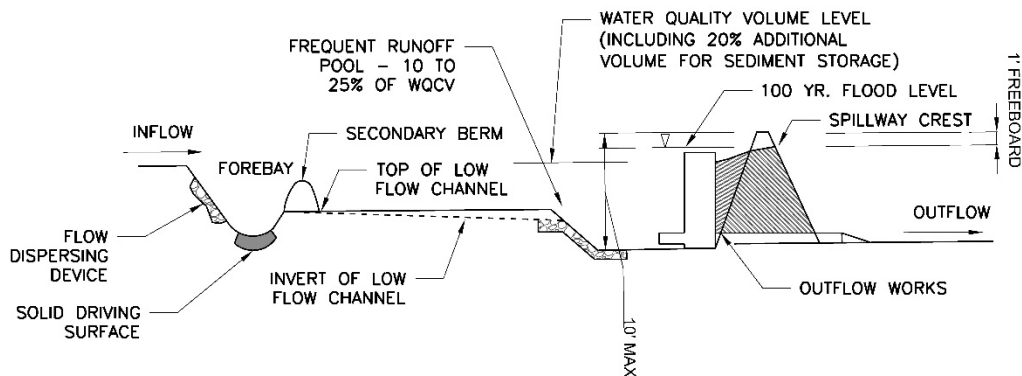


Figure 7004-8: Extended Detention Basin Cross-Section

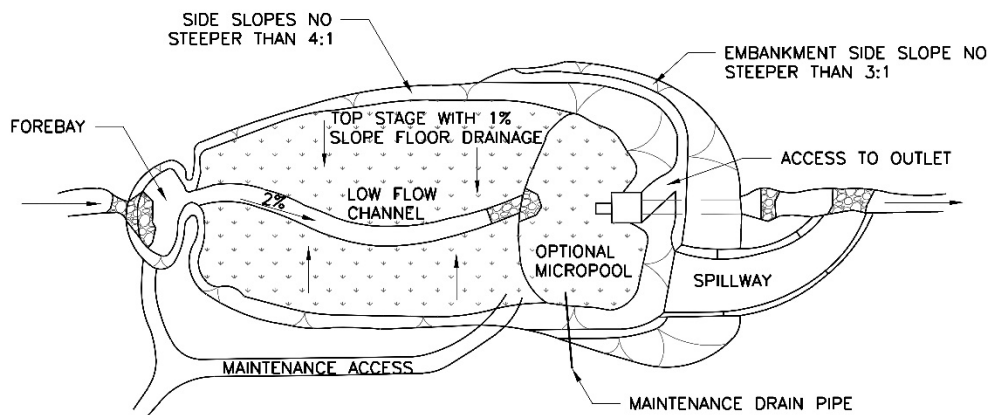


Figure 7004-9: Extended Detention Basin Plan View

1. Basin Size

- a. Design volume equal to water quality volume. Volume begins at the lowest orifice in the outlet structure.
- b. Designing dry ED basins with a high length to width ratio (i.e., at least 2:1) and incorporating other design features to maximize the flow path effectively increases the detention time in the system by eliminating the potential of flow to short circuit the basin.
- c. Drainage area less than 100 acres but large enough to use 12" or larger orifice size to prevent clogging.
- d. The depth of the basin should not exceed 10 feet. Any pond embankment configuration meeting the criteria for dam safety requirements must follow the criteria of the Oklahoma Water Resources Board.

2. Basin Elements

a. Forebay Design:

- The forebay provides an opportunity for larger particles to settle out in an area that can be easily maintained. The length of the flow path through the forebay should be maximized, and the slope minimized to encourage settling.
- The sediment forebay should be sized for 20% of the WQV.
- The forebay outlet should be sized to release 2% of the undetained peak 100-year discharge.
- For regional facilities not specific to a certain development, portions of the watershed may remain disturbed for an extended period of time. In this case, the forebay size will need to be increased due to the potentially high sediment load.
- An earthen berm with 3H:1V side slopes (or flatter) and a pipe outlet or a concrete wall with a notch outlet should be constructed between the forebay and the main basin.
- Erosion protection should be provided on the downstream side of the forebay berm/wall if the downstream grade is lower than the top of the berm or wall.

b. Basin Design

- Embankments should have side slopes no steeper than 3:1. Riprap-protected embankments should be no steeper than 2:1. Geotechnical slope stability analysis is recommended for embankments greater than 10 feet in height and is mandatory for embankment slopes steeper than those given above. All embankments must be designed to State of Oklahoma Water Resources Board criteria for dam safety.
- The bottom area of storage facilities should be graded toward the outlet to prevent standing water conditions. Minimum slope of 1% along side slopes and 2% along main flow path from inlet to outlet. Designing basins with relatively flat side slopes can also help to lengthen the effective flow path.
- Emergency spillway should be included in the basin design to safely pass the 100-year storm. The spillway prevents water levels from overtopping the embankment and causing structural damage. The emergency spillway must be located so that downstream structures will not be impacted by spillway discharges.

- A minimum of 1 foot of freeboard must be provided, measured from the top of the water surface elevation for the 100-year storm event, to the lowest point of the embankment.
- Stormwater should be conveyed to and from dry ED basins safely and to minimize erosion potential.

c. Low Flow Channel:

- Convey low flows from the forebay to the micropool with a low flow channel. The channel should have a minimum flow capacity equal to the maximum release from the forebay outlet.
- For concrete channels, a side slope between 0.4% - 1% is recommended to encourage settling while reducing the potential for low points within the section.
- To prevent stream warming, designers can place landscaping to provide shade around low flow channel and the basin outlet.

d. Micropool and Outlet Structure:

- Locate the outlet structure in the embankment and provide an optional permanent micropool directly in front of the structure. Micropools reduce shallow wet areas where mosquito breeding can happen.
- Submerge the well screen to the bottom of the micropool. This will reduce clogging of the well screen because it allows water to flow through the well screen below the elevation of the lowest orifice even when the screen above the water surface is plugged. This will prevent shallow ponding in front of the structure, which provides a breeding ground for mosquitoes (large shallow puddles tend to produce more mosquitoes than a smaller, deeper permanent pond).
- Micropool side slopes may be vertical walls or stabilized slopes of 3H:1V maximum.
- For watersheds with less than 5 impervious acres, the micropool can be located inside the outlet structure.
- The micropool should be at least 2.5 feet in depth with a capture volume of 15-25% of the WQV.
- The bottom should be concrete unless a baseflow is present or anticipated or if groundwater is anticipated. Riprap is not recommended because it complicates maintenance operations.

- Where possible, place the outlet in an inconspicuous location.
- The outlet should be designed to release the WQV over a 48-hour period. No more than 50% of the water quality volume should drain from the facility within the first 24 hours.
- Outlet structure can consist of a weir, orifice, outlet pipe, combination outlet, or other acceptable control structure. Coordinate with a professional engineer to determine if a pipe cradle through the embankment is warranted.
- A dry ED basin has a channel protection orifice with a minimum diameter of 3 inches. The orifice diameter may be reduced to 1 inch if internal orifice protection is used (e.g., an over-perforated vertical stand pipe with 0.5-inch orifices or slots that are protected by wirecloth and a stone filtering jacket). Adjustable gate valves can also be used to achieve this equivalent diameter.
- Seepage control or filter diaphragms should be provided for all outlet pipes.
- Riprap, plunge pools or pads, or other energy dissipaters are to be placed at the end of the outlet to prevent scouring and erosion. If the basin discharges to a channel with dry weather flow, care should be taken to minimize tree clearing along the downstream channel, and to reestablish a forested riparian zone in the shortest possible distance from the dry ED basin.
- The facility should have a separate drain pipe with a manual valve that can completely or partially drain the pond for maintenance purposes. To allow for possible sediment accumulation, the submerged end of the pipe should be protected, and the drain pipe should be sized one pipe schedule higher than the calculated diameter needed to drain the pond within 24 hours. The valves should be located at a point where they can be operated in a safe and convenient manner.

e. Initial Surge Volume

- Providing a surcharge volume above the micropool for frequently occurring runoff minimizes standing water and sediment deposition in the remainder of the basin. This is critical to turf maintenance and mosquito abatement in the basin bottom. The initial surcharge volume is not provided in the micropool nor does it include the micropool volume. It is the available storage volume that begins at the water surface elevation of the micropool and extends upward to a grade

break within the basin (typically the invert of the trickle channel) The area of the initial surcharge volume, when full, is typically the same or slightly larger than that of the micropool.

- The initial surcharge volume should have a depth of at least 4 inches. For watersheds of at least 5 impervious acres, the initial surcharge volume should also be at least 0.3% of the WQV.
- The initial surcharge volume is considered a part of the WQV and does not need to be provided in addition to the WQV.

f. Trash Rack

- Provide a trash rack (or screen) of sufficient size at the outlet to provide hydraulic capacity while the rack is partially clogged. Openings should be small enough to limit clogging of the individual orifices. The trash rack should be sloped with the basin side-slopes.

g. Landscaping

- Designers should maintain a vegetated buffer around dry ED basins, selecting plants within the detention zone (i.e., the portion of the basin up to the elevation where stormwater is detained) that can withstand both wet and dry periods. The side slopes of dry ED basins should be relatively flat to reduce safety risks.
- Woody vegetation may not be planted or allowed to grow within 15 feet of the toe of the embankment nor within 25 feet from the principal spillway structure.
- Plantings should be designed not to conflict with the current drainage of the basin.
- All trees should be kept away from any drainage structures to allow for maintenance access and repairs as needed.

C. Construction and Maintenance Requirements

1. Provide appropriate maintenance access to the forebay and outlet works.
2. Monthly or as needed:
 - a. Remove trash, sediment, and debris from forebay and inlet and outlet structures.
 - b. Mow the embankment and maintenance access. Periodically mow along maintenance rights-of-ways and the embankment. Remove grass clippings.

3. As needed:

- a. Repair and re-vegetate eroded areas.
- b. Remove and dispose of vegetation that may hinder the operation of the pond.
- c. Perform structural repairs to pond, outlet structures, embankments, control gates, valves, or other mechanical devices.
- d. Remove sediment when volume of pond is reduced by 10%.

7004.3 Wet Ponds

A. Introduction

Wet ponds are stormwater basins constructed with a permanent (dead storage) pool of water equal to the water quality volume. Stormwater runoff displaces the water already present in the pool during a storm event. Temporary storage (live storage) is also provided as an extended detention volume above the permanent pool elevation. Flood detention storage can also be stacked on top of extended detention volume to detain larger flood flows.

B. Design Criteria

Minimum of 25 acres is needed for a wet pond or wet ED pond to maintain a permanent pool. Smaller drainage area may be acceptable with an adequate water supply and anti-clogging device.

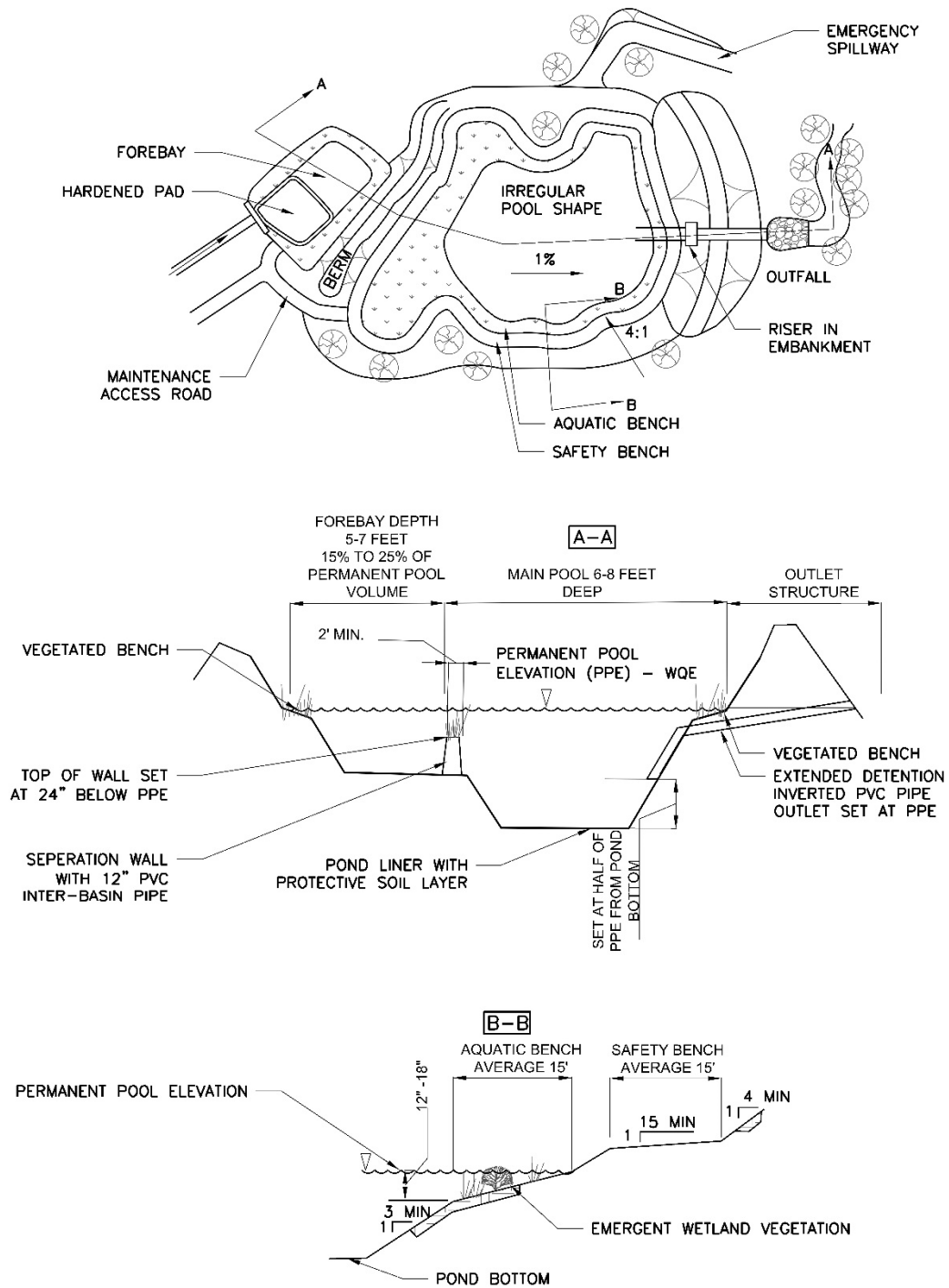


Figure 7004-10: Wet Pond Plan View and Cross-Sections

1. Capture Volume

Wet ponds in general are designed to have three stages with three corresponding volumes, which are intended to meet the water quality and detention requirements. The first two stages, permanent pool and extended detention, are required for all ponds and function primarily as a water quality control. The second stage may also serve as a streambank erosion prevention measure. The third stage, flood control detention, serves as a flood control measure and is optional to the design of the wet pond.

The permanent pool and extended detention volume shall be designed for the entire drainage area contributing to the control for which water quality controls are not already provided. Offsite areas, which are currently undeveloped, may be assumed undeveloped in the design. The primary reason to require extended detention for all of the developed drainage areas, which have not provided detention, is to prevent pond washout caused by high flow-through rates.

a. Permanent Pool

- The permanent pool, the lowest stage of the pond, is designed to hold and treat the WQV between storm events through quiescent settling and biological uptake. The permanent pool should remain nearly full at all times (maximum 12" below the permanent pool) to provide a source of water for wetland plants which are used for biological uptake and to minimize turbulence within the pond during storm events which may result in resuspension of sediment. During storm events, the pond is designed to flush out the treated water and replace it with "new" runoff. The minimum surface area of the permanent pool must be greater than ½ acre.
- The permanent pool volume should be sized to 100% of the water quality treatment volume. When the drainage area to the pond contains only uplands, an increase of volume by five percent is acceptable to account for sedimentation loss. If the pond is located where it may receive streambed loads, a more detailed analysis will be required to account for storage losses.

b. Extended Detention

- The extended detention portion of the pond minimizes turbulence in the pond by decreasing the pond flow-through rate and increasing the time in which sedimentation can occur during the storm through dynamic settling. The extended detention volume for wet ponds should be designed to detain half the water quality volume. The

extended detention volume cannot include the volume provided in the permanent pool because the permanent pool is designed to be full at the start of the rainfall event.

c. Flood Control Detention (optional)

- The standard detention volume should be designed to meet the city's flood control requirement, in accordance with **Section 5000:** of the EDC and it may include the volume contained as extended detention.

2. Drainage Area

The drainage area to the pond must have the following characteristics.

a. Size Limits

- The drainage area must be large enough to allow an adequate supply of runoff. A minimum drainage area of twenty-five acres is needed. Smaller drainage areas will be considered based upon a demonstration that the wet pond can provide pond depths great enough to minimize water surface fluctuations, an adequate area for vegetation, and enough surface area to allow aeration dictates this minimum drainage area. The drainage area may not exceed 320 acres.

b. Site Slope

- There should not be more than 15% slope across the drainage area to the pond.

c. Phased Development

- A wet pond that serves a phased development may not have adequate impervious cover to generate the necessary runoff during the initial phases. In this instance, a plan must be submitted that demonstrates what accommodations will be made to address this concern.

d. Hazardous Materials Traps

- Spills of hazardous liquids can severely damage or kill the biota of a wet pond. Therefore, developments where the transportation, storage, or distribution of hazardous materials is anticipated should include hazardous material traps in the drainage system immediately upstream of the wet pond inlet.

3. Basin Elements

The permanent pool volume must be held in two compartments. The first is called the sediment forebay and the second is called the main pool. These basins must consist of deep pools and shallow vegetated

benches. Other aspects of the pond include maintenance access points, maintenance pads, an outlet structure, and an impermeable liner.

a. Basin Geometry, Plug Flow, Short-Circuiting, Dead Storage, and Multiple Inlets

- Wet ponds work best when the water already in the pond is moved out in mass by incoming flows. The pond should be designed to enhance plug flow characteristics and minimize short-circuiting and dead storage. Design features that encourage plug flow and avoid dead storage are:
 - Dissipating energy at the inlet.
 - Providing a large length-to-width ratio (no less than 2:1).
 - Provide a broad surface for water exchange using a berm or island that functions as a broad-crested weir, separating the pond into two cells, a sediment forebay and the main pool.
 - Maximizing the flow path between the inlet and outlet.
 - Make pond wide enough to achieve water depth of 6'+ for more than 50% of the pond area.
- Wet ponds with multiple inlets should be avoided. If unavoidable, the professional engineer will be required to demonstrate that the proposed design will provide treatment equivalent to a design that does not have multiple inlets. This may require providing additional permanent pool volume. Each inlet must have a sediment forebay provided, as described below.

b. Sediment Forebay

- All runoff from impervious areas must discharge into a sediment forebay to capture coarse sediment and trash in a location that can be easily assessed for maintenance purposes. Sediment forebays must be designed to minimize short-circuiting and dead storage problems.
- Energy dissipation is needed at the inflow point(s) to prevent scouring of the basin floor and to quickly reduce the turbulence within the forebay.
- The forebay must hold fifteen to twenty-five percent of the permanent pool volume.
- The sediment forebay and main pool must be separated by an earthen berm (preferably utilized as a portion of the vegetated bench), or using a six inch or thicker reinforced

concrete wall. The top of the wall should be set at twenty-four (24) inches below the permanent pool water surface elevation. The submerged earth berm should have a minimum top width of two feet and meet the following conditions:

- The material used for construction must be stable when saturated and when the maximum hydrostatic force is applied.
 - The side slope must be stable when saturated.
 - Shall be constructed to avoid damage to the liner and to prevent seepage between the berm and the liner.
 - The berm must protect against erosive forces on the top of the berm in high flow conditions. When the earth berm is used, it should also be included as part of the vegetated bench.
- The forebay and main pool must be hydraulically connected with a horizontal twelve inch or larger Schedule 40 PVC pipe called an inter-basin pipe to ensure that there will be an adequate supply of water in the forebay in dry conditions. The elevation of the inter-basin pipe should be two feet above the bottom of the forebay and a plug valve included in the line to allow independent draining (by pump) of the sediment forebay after drawing both basins down to the top of the separating wall.
- The sediment forebay must have a depth from five to seven feet.
- A maintenance pad must be provided to allow for routine removal of sediment using heavy equipment soon after the basin is drained without requiring additional time for the basin bottom to dry. The pad is to be made of reinforced concrete and be a minimum of twelve feet by sixteen feet. The pad may be located outside of and adjacent to the forebay, or at the bottom of the forebay. If the latter, the bottom of the forebay should have a minimum two percent slope towards a low point. This maintenance pad must be enlarged as needed to cover the portion of the basin which cannot be sloped inward at two percent. An examination of the hydrostatic forces on the maintenance pad when the forebay is empty and the main pool is full should be performed when designing the thickness of the pad. Pads less than four inches in thickness are prohibited. The maintenance pad should not compromise the integrity of the pond liner.

- The professional engineer should incorporate an impermeable membrane or additional liner material to prevent excess leakage at the edge of the maintenance pad. A twelve-foot-wide concrete maintenance access ramp with a maximum slope of four to one and broom finish must lead from at least twelve inches above the permanent pool elevation to the maintenance pad.

c. Main Pool

- The main pool must contain the remainder of the permanent pool volume and have a depth from six to eight feet. Areas deeper than eight feet may result in the pond becoming anaerobic, possibly resulting in odors, and are prohibited unless approved by the City. The main pool must be designed to minimize short-circuiting and dead storage problems.

d. Vegetated Bench

- A permanently submerged shallow wetland area incorporated into and/or surrounding the pond must be provided and is called the vegetated bench. The vegetated bench must be a minimum of five (5) to fifteen (15) percent of the total pond area. The slope of the vegetated bench must be in accordance with Table below.

e. Submerged Inlets

- Submerged inlets are to be avoided whenever possible. In situations where site conditions require a submerged inlet then the portion of the inlet pipe that is placed below the permanent pool elevation must be designed to store water, not simply convey it. In these situations, the pond liner must extend and surround the portion of the inlet pipe that is designed to be under water.

f. Pond Liner

- The sediment forebay and main pool must have an impermeable liner to contain the runoff and to prevent excessive seepage in accordance with 7002.5.
- Protective soil layer above the liner - All areas of the pond that are to receive and support vegetation must have a protective soil layer installed on top of the liner, regardless of the type of liner, so that plantings can be properly installed above the liner and the liner integrity can be maintained. This protective soil layer must be a minimum of 12-inches in thickness.

g. Pond Side Slopes

- Pond earthen side slopes must not be steeper than a four to one ratio, and must be designed to ensure their stability, especially when saturated. The pond liner must extend up the side slopes as high as is necessary to maintain a permanent pool volume. Where the liner extends under the separating berm, it is not necessary for the liner to extend up the side slopes of the separating berm. Utility lines may not be located within ten feet from the top of the pond side slope.

h. Dam Safety

- Any pond embankment configuration meeting the criteria for dam safety requirements must follow the criteria of the Oklahoma Water Resources Board.

4. Outlet Structures

The design of the outlet pipe is important to enhance the plug flow characteristics of the pond. This section provides criteria in designing the outlet structure. Other designs will be evaluated for their ability to provide plug flow and maintainability. In most cases, the ponds will be designed with two primary outlet structures and a maintenance drain. In all cases, the extended detention volume must drawdown within 48 hours but no less than 24 hrs. Energy dissipation is required to prevent erosion at the outfall location.

a. Extended Detention

- *The extended detention outlet structure must be constructed using an inverted PVC pipe with the soffit of the inlet set at an elevation which is one half ($\frac{1}{2}$) of the permanent pool depth from the bottom. The flow line of the outlet of the pipe must be set at the permanent pool elevation. No outlet other than the extended detention outlet will be permitted below the extended detention volume. In all cases, the pond will be designed so that the minimum pipe diameter is no less than six inches to minimize clogging potential; the size of the orifice at the end of the pipe may be smaller than six inches to achieve the required extended detention. If an orifice plate is used to achieve the required 48 hour drawdown, the orifice must be removable and accessible when the pond is at the extended-detention elevation in order to service blockage. It is recommended that this line discharge into the manhole required for the maintenance drain and discussed in that section.*
- If an orifice is not used to control the drawdown, the flow in the inverted discharge pipe used for extended detention must be calculated using a method that more accurately

accounts for energy losses than the orifice equation. One equation that may be used is:

$$Q = A \left(\frac{2gh}{1+k_e+k_b+k_f} \right)^{0.5} \quad (34)$$

Where,

Q=flow (cfs)

A=cross-sectional area of the pipe (ft²)

g=acceleration due to gravity (32.2 ft/s²)

k_e=entrance loss coefficient

k_b=bend losses

k_f=friction loss coefficient. The friction loss coefficient can be found using the equation:

$$K_f = \frac{29Ln^2}{R^{1.33}} \quad (35)$$

Where,

L=pipe length (ft)

n=Manning's roughness coefficient

R=hydraulic radius (ft)

b. Flood Control Detention

- **EDC Section 5000:** must be referenced for design of the outlet structure to serve for flood control. When flood control detention is not needed, an overflow spillway capable of passing the 100-year storm is required at or above the elevation at which the extended detention volume is provided. To enhance water quality, a two to one length to width ratio from the inflow to the outflow must be maintained.

c. Maintenance Drain

- A drain line, which can completely or partially drain the permanent pool, must be included where topographic relief exists. The purpose of the drain is to allow for the pond to be drained for long-term maintenance activities. A plug valve must be installed in the line, and the valve must be protected by enclosing it in a manhole set in the pond berm. If the maintenance drain cannot completely drain the pond, a 6 ft. × 6 ft. square concrete pump pad must be provided at the lowest point in the main pool to provide a base for temporary installation of a submersible pump.

C. Biological Elements

Biological elements are an important aspect to the function as well as the aesthetics of the wet pond system. The following criteria must be followed to enhance pollutant removal and minimize undesirable activity.

1. Wetland Plantings

The functions of plants in a wet pond are to physically slow the flow of water and cause suspended particles to fall out, provide a substrate on which associated microbes assimilate organics, metals, and nutrients, take up pollutants from the sediment into the roots, and oxygenate the water.

To determine the minimum requirement for wetland plant quantity, multiply the surface area (in square feet) of the permanent pool by three percent (0.03).

All wetland plants which fulfill the minimum landscape requirements shall be propagated from, or harvested from, regionally adapted stock. These are plant species or genotypes which are native to a range of within 200 miles of the project site. Wetland plants grown outside the state of Oklahoma are not acceptable. Plants not intended to meet minimum requirements do not need to be native or regionally adapted stock however under no circumstances may invasive plants be planted. Refer to Section B of Appendix F of Zoning Ordinance, Trees and Plants for Oklahoma City, 2016, and/or OSU Extension's Plant Selections for Oklahoma for native allowed plantings.

A minimum of 90% of the vegetation shall be alive and viable for one year following installation.

Wetland plants are adapted to specific water depths. These criteria identify pond planting zones based on the depth of the permanent pool. Install plants at water depths appropriate to the species. The water depths noted in the following tables show the range of depths in which these plants must be planted. The plants will often colonize deeper water than that in which they are planted. Taken together, the following zones comprise the vegetated bench.

a. Pond Bank Slopes

- Plant material must be able to withstand frequent inundation with water, as well as occasional drought. If shading is needed along the shoreline, the more rapidly-growing species such as Sycamore are preferred over the more slowly developing species, such as Swamp White Oak. Plants must be able to withstand periodic inundation of water after storms, as well as occasional drought during the warm summer months. Plants should stabilize the ground from erosion caused by runoff. In between storms, typical

moisture conditions may be moist, slightly wet, or even exhibit drought conditions during the dry weather periods. Ground cover on the berms should be very low maintenance because they may be difficult to access on steep slopes or if frequency of mowing is limited. Woody vegetation may not be planted or allowed to grow within 15 feet of the toe of the embankment nor within 25 feet from the principal spillway structure.

b. Pond Edge Zone

- The pond edge zone is an area of saturated soil surrounding the perimeter of the pond. The zone extends from an elevation 3" above the permanent pool level to an elevation 3" below the permanent pool level. While a portion of this zone is above the elevation of the vegetated bench, native plants listed in Refer to Section B of Appendix F of Zoning Ordinance, Trees and Plants for Oklahoma City, 2016, and/or OSU Extension's Plant Selections for Oklahoma that are installed in this area will count towards fulfilling the required minimum number of plants.

c. Marsh Zone

- The marsh zone is the shallow water area within the pond. The zone extends from an elevation 3" below the permanent pool level to an elevation 12" below the permanent pool level.

d. Deep Water Zone

- The deep water zone extends from an elevation 12" below the design pool level down to an elevation 24" below the design pool level. This zone includes submergent plants (which grow underwater), floating-leaved aquatic plants, and tall emergent plants. Install submergent and floating-leaved aquatic plants throughout the pond to encourage colonization in a variety of locations, including the submerged earthen berm between the sediment forebay and the main pool.

2. Integrated Pest Management

As with any landscape, there is a need for pest management in wet ponds. To the extent possible, these criteria are designed to minimize the potential for pests within a wet pond.

a. Algae

- High nutrient loads in wet ponds may cause algae blooms to occur. Pungent odor is often associated with these algal blooms. However, treating with an algaecide is not

recommended because blooms are usually short lived and are considered desirable for nutrient removal. The use of submergents and floating-leafed aquatics can reduce the extent of alga blooms by reducing nutrient loads and shading the water.

b. Wildlife

- Wildlife are occasionally a pest of wet ponds. Evaluation of the potential of such wildlife inhabiting or being attracted to the proposed pond site is required. When there is a potential for such activity, fencing or similar exclusionary method must be provided.

c. Mosquito Control

- Mosquitoes are problematic in urban areas. There is the potential for standing water in wet ponds to become ideal breeding localities. The wet pond should be stocked with the local native fish species *Gambusia affinis* to serve as a biological control for mosquitoes. *Gambusia* provide effective control for mosquitoes, eliminating the need for chemical control. *Gambusia* should be stocked at the initial density of 200 individuals per surface acre. Additionally, the City will accept the introduction of species as recommended by the OK Department of Wildlife Conservation.

d. Domestic Waterfowl

- Domestic waterfowl, including geese and swans can destroy vegetation and increase pollutant loading in wet pond systems. In addition, waterfowl can become nuisances to property owners near the pond. For these reasons, domestic waterfowl should not be introduced into these systems.

e. Fish

- Fish other than *Gambusia affinis* should not be introduced into a wet pond.

3. Water

a. Pond Water Losses

- While fluctuation of the permanent pool level is to be expected due to climatic conditions, type and extent of vegetation, phased developments and other factors, the minimum level acceptable at any time is 12" below the permanent pool (the lower limit of the marsh zone). This minimum water level is necessary for both aquatic plant survival and, if the liner material is clay, to keep the clay moist to prevent cracking.

- A water balance is necessary to determine if the pond is experiencing a water loss in excess of normal anticipated losses. It must be performed to develop performance criteria for the pond to be measured against upon completion of the pond construction. The professional engineer must specify criteria for acceptance testing of the pond over a specified period of time, using actual daily water level measurements, actual daily precipitation data, and other required data to determine whether the pond is losing water in excess of anticipated losses.
- One reason the permanent pool may stabilize lower than the design level is if development in the contributing watershed is phased in over a long period of time, such that the impervious cover and runoff coefficient at the early phases of construction are less than the final, build-out values. In this case the amount of water available to fill the wet pond may be lower at the earlier development phase, which would strand the vegetated bench below the permanent pool level, an unacceptable situation. The designer and contractor must ensure that the vegetated bench is submerged per the above criteria for wetland plant survival and to maintain liner integrity. It is unacceptable for the water level to remain low for an extended period of time, such that the health of the wetlands plants is threatened due to lack of moisture.

b. Aeration and Recirculation Unit (optional)

- Privately maintained wet ponds may include some type of aeration device (such as a fountain) which could enhance the dissolved oxygen concentration. Increased dissolved oxygen prevents the pond from becoming anaerobic, hence minimizing problems with odor from bacterial decomposition.

c. Make-up Water

- The water balance should use a daily time step and account for all significant inflows (rainfall, runoff, supplemental water) and outflows (evaporation of open water, evapotranspiration of wetland vegetation/vegetated bench, seepage, water withdrawals). A range of climatic conditions should be modeled, including but not limited to, average and dry years. The water balance serves two purposes. First, it is necessary to provide information for determining pond sizing requirements and any supplemental (makeup) water requirements, as applicable.
- A nearby source for non-chlorinated make-up (supplemental) water is recommended as a way to maintain an adequate permanent pool level should the level drop to a severe

drought. Potable and effluent water is not an acceptable make-up water source. Demonstrate that the quality of the make-up water is in compliance with all applicable regulations and will not harm the pond biology.

D. Construction and Maintenance Requirements

1. Construction

- a. In mature ponds with abundant vegetation, aquatic plants supply the necessary litter layer and aerobic zone for microbial activity. However, since new ponds lack a sufficient source of organic matter, an appropriate amount of carbon (straw, hay, leaf clippings, soil, and other non-woody material) shall be installed during construction. After the pond liner is in place, yet prior to allowing the pond to be filled, spread the plant litter evenly on the sides of the pond (below the permanent pool level). Treat the entire shallow water bench in this manner, and all pond slopes (ranging from 3:1 to 10:1). The minimum required amount of plant litter is 45 pounds per 1,000 square feet of slope. When using coastal hay, this requirement can be expressed as 1.5 bales at 30 lb./bale. Ensure that the plant litter will not float by attaching the litter to the slopes (with staples or other appropriate methods). Cover a minimum of 40% of the slope surface area.
- b. After the pond liner is completed, the basin must fill up with water within a reasonable time period, preferably within one week. Safety concerns and pond liner integrity concerns must be properly addressed during pond construction.
- c. Accumulation of sediment in the basin is the primary reason the pond will require intensive maintenance. Because of this, very careful attention should be paid to adequate, well-maintained erosion and sedimentation controls in the contributing drainage area during construction. This, in combination with the sediment forebay, should prevent the requirement of maintenance of the main pool soon after the pond is put online.
- d. The sediment load to the sediment forebay shall be closely monitored after every storm event. If heavy sediment loads are detected during an inspection, the source should be corrected. Sediment shall be removed from the sediment forebay when one-third of the forebay volume is lost.
- e. Any sediment build-up (greater than 5% volume loss) shall be removed from the forebay upon completion of site revegetation. The sediment build-up in the main pool shall be checked and if more the ten-percent of the volume is lost, it should be cleaned at that time.

2. Maintenance

a. Monthly

- Inspect inlet and outlet structures for debris and illegal dumping. Remove debris as needed. Check for potential undercut or eroded areas during monthly inspection. Repair as needed.

b. Every Three Months for the First Two Years

- During the three month initial inspection cycle, if more than fifteen percent of the volume of the forebay is lost, it shall be cleaned at that time.

c. Every Three Months

- Turf areas along maintenance ROW should be mowed. Accumulated paper, trash, and debris shall be removed every three months or as necessary. Cattails, cottonwoods, and willows can quickly colonize shallow water and the edge of the pond. These species or any areas of plant overgrowth may be thinned at this time or as needed.

d. Semiannual Inspection

- Inspect for invasive vegetation along within the pond and along the banks. If wetland components are included in the design, inspect for wetland invasive species.

e. Annually

- The basin should be inspected annually for side slope erosion and deterioration or damage to the structural elements. Any damage shall be repaired. Large areas, which have dead or missing vegetation, shall be replanted.
- Move banks and buffers once a year or every other year.
- Check for signs of eutrophic conditions, hydrocarbon build-up, review mechanic devices, if applicable. Confirm structural integrity of the downstream face of the dam, and review wetland plant management and harvesting needs.

f. Every Three Years

- The sediment build-up in the sediment forebay shall be checked. The sediment forebay shall be cleaned if more than one-third of the forebay volume is lost.

g. Every Six Years

- The sediment build-up in the main pool shall be checked. Sediment shall be removed from the main pool when twenty percent of the main pool volume is lost.

- Consider the source of the excavated sediments during pond maintenance. If sources upstream are known to be contaminated, land application of sediment is not permitted. Contaminated sediment must be disposed of to prevent further contamination of existing site conditions. Analytical tests may be required prior to sediment disposal or reuse.

7005 MANUFACTURED SYSTEMS

7005.1 Introduction

Some manufactured systems will also be approved for usage in the City. Manufactured systems are commercial products that typically aim at providing stormwater treatment in space-limited applications. The most commonly encountered classes of proprietary stormwater management controls include hydrodynamic separation, catch basin insert technologies, cartridge filter-type controls, and proprietary biotreatment devices. Each project will require the professional engineer to work with the vendor to develop the design.

A. Hydrodynamic separation devices (alternatively, swirl concentrators)

- Remove trash, debris, and coarse sediment from incoming flows using screening, gravity settling, and centrifugal forces generated by forcing the influent into a circular motion.
- By having the water move in a circular fashion, rather than a straight line, it is possible to obtain significant removal of suspended sediments and attached pollutants with less space as compared to wet vaults and other settling devices. Hydrodynamic devices were originally developed for combined sewer overflows (CSOs), where they were used primarily to remove coarse inorganic solids. Hydrodynamic separation has been adapted for stormwater treatment by several manufacturers and is currently used to remove trash, debris, and other coarse solids down to sand-sized particles. Several types of hydrodynamic separation devices are also designed to remove floating oils and grease using sorbent media.

B. Catch basin inserts

- Manufactured filters or fabric placed in a drop inlet to remove sediment and debris and may include sorbent media to remove floating oils and grease.
- There are a multitude of inserts of various shapes and configurations, typically falling into one of three groups: socks, boxes, and trays.
- The sock-type filters are typically constructed of a fabric, usually polypropylene. The fabric may be attached to a frame, or the grate of the inlet may hold the sock. Socks are meant for vertical (drop) inlets.

- Boxes are constructed of plastic or wire mesh. Typically, a polypropylene “bag” is placed in the wire mesh box and the bag takes the form of the box. Most box products are one box; that is, settling and filtration through media occur in the same box.
- The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.
- Inserts are an easy and inexpensive retrofitting option because drain inlets are already a component of most standard drainage systems. Inserts are usually only suitable for mitigating relatively small tributary areas (less than 1 acre).

C. Cartridge filter–type controls

- Typically consist of a series of vertical filters contained in a vault or catch basin that provide treatment through filtration and sedimentation.
- The vault may be divided into multiple chambers where the first chamber acts as a pre-settling basin for removal of coarse sediment while another chamber acts as the filter bay and houses the filter cartridges.
- The performance and capacity of a cartridge filter installation depends on the properties of the media contained in the cartridges. Cartridge filter manufacturers often provide an array of media types each with varying properties, targeting various pollutants and a range of particle sizes. Commonly used media include media that target solids, such as perlite, and media that target both dissolved and non-dissolved constituents, such as compost leaf media, zeolite, and iron-infused polymers.
- Manufacturers try to distinguish their products through innovative designs that aim at providing self-cleaning and draining, uniformly loaded, and clog resistant cartridges that functional properly over a wide range of hydraulic loadings and pollutant concentrations.

D. Biotreatment devices

- Manufactured to mimic natural systems such as wetlands by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or higher volumes and with smaller footprints than their natural counterparts.
- Incoming flows are typically filtered through natural media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm system.

- Contributing drainage areas to biotreatment devices tend to be limited to 0.5 to 1.0 acres.
- The vendors of the various manufactured SCMs provide detailed documentation for device selection, sizing, and maintenance requirements. Contributing drainage area sizes are limited to the capacities of the largest available model. The latest manufacturer supplied documentation must be used for sizing and selection of all proprietary devices.

7005.2 Design Requirements

Proprietary SCM vendors are constantly updating and expanding their product lines, so refer to the latest design guidance from the vendors.

Use of any manufactured system must be approved by the City and be:

An approved best management practice listed in **Texas Commission on Environmental Quality RG-348** including Addendum Sheet, or;

An approved technology from the **State of Washington Department of Ecology Technology Assessment Protocol- Ecology table that meets either the conditional use level designation or general use level designation.**

A. General Design

- For units maintained by the City, the designer shall work with the City to determine appropriate placement such that the unit can be maintained properly.
- Hydrodynamic separation devices are effective for removal of course sediment, trash, and debris, and are useful as pretreatment in combination with other types of SCMs that target smaller particle sizes.
- Catch basin inserts come in such a wide range of configurations that it is practically impossible to generalize the expected performance. Inserts should mainly be used for catching coarse sediments and floatable trash and are effective as pretreatment in combination with other types of SCMs. Trash and large objects can greatly reduce the effectiveness of catch basin inserts with respect to sediment and hydrocarbon capture. Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.
- Cartridge filters have been proven to provide efficient removals for both dissolved and non-dissolved constituents. Cartridge filters are, however, less adept at handling high flow rates as compared to catch basin inserts and hydrodynamic devices, mainly due to the enhanced treatment provided through the filtration mechanism.

- Biotreatment devices are relatively new compared to the other types of proprietary treatment devices included in this document. Therefore, there are fewer third party studies on these devices and the available performance information is mostly vendor-supplied. According to the vendors, like their natural counterparts, biotreatment devices are highly efficient at mitigating dissolved metals, nutrients, and suspended solids.
- More detailed performance information is available from the vendors of each class of proprietary device. The performance numbers are typically presented as percent removals rather than effluent quality measurements and can be found on the vendor websites.

B. Sizing

- Hydrodynamic devices, catch basin inserts and cartridge filters are flow-based SCMs and therefore should be sized to capture and treat the flow rate based on the WQV if used as a standalone SCM.
- Proprietary biotreatment devices include both volume-based and flow-based SCMs. Volume-based proprietary devices should be sized to capture and treat the water quality design volume if used as a standalone SCM.
- Auxiliary components of proprietary devices such as sorbent media, screens, baffles, and sumps are selected based on site specific conditions such as the loading that is expected and the desired frequency of maintenance.
- Sizing of proprietary devices is reduced to a simple process whereby a model can simply be selected from a table or a chart based on a few known quantities (tributary area, location, design flow rate, design volume, etc).
- A few of the manufacturers either size the devices for potential clients or offer calculators on their websites that simplify the design process even further and lessens the possibility of using obsolete design information.
- For the latest sizing criteria, refer to the manufacturer's website.

7005.3 Construction and Maintenance Requirements

- A. Specific design, maintenance, and construction requirements will be provided by the vendor.
- B. All maintenance and construction requirements should be reviewed and included in cost estimates and project documentation.
- C. Hydrodynamic separators do not have any moving parts and are

consequently not maintenance intensive. Maintenance is important, however, to ensure that they are operating as efficiently as possible. Proper maintenance involves frequent inspections throughout the first year of installation, especially after major storm events. The systems are considered full when the sediment level is within one foot of the unit's top, at which point it must be cleaned out. Removal of sediment can be performed with a sump vac or vactor truck. Some hydrodynamic separator systems may contribute to mosquito breeding if they hold standing water between storms. Refer to manufacturer's criteria for inspection and maintenance activities.

- D. Catch basin inserts can be maintenance intensive due to their susceptibility for accumulating trash and debris. Regular maintenance activities include the cleanup and removal of accumulated trash and sediment, while major maintenance activities include replacing filter media (if used) and or repairing/replacing geotextile fabrics. There are a number of proprietary catch basin inserts and proper maintenance procedures should be determined based on manufacturer's recommendations for the selected catch-basin insert.
- E. Cartridge filters maintenance activities include periodically removing captured trash, debris, and sediment from the vault floor, typically twice per year depending on the accumulation rate, using a sump vac or vactor truck. The media in media filters has to be replaced when it becomes saturated, typically about once every other year, also depending on the pollutant accumulation rate. The manufacturers of these devices typically provide contract operation and maintenance services. All stormwater vaults that contain standing water can become a breeding area for mosquitoes. Manufacturers have developed systems to completely drain the vault, such as a perforated pipe installed in the bottom of the vault that is encased in a filter sock to prevent clogging.
- F. Biotreatment Devices maintenance can be provided by the manufacturers and typically consists of routine inspection and hand removal of accumulated trash and debris. As opposed to other proprietary treatment devices, no vactor trucks or mechanical maintenance is needed.

END OF SECTION 7000

APPENDIX A

Traffic Study Guidelines

1.0 INTRODUCTION

The City of Norman is responsible for providing a safe and efficient transportation system for its residents. One of the Action Items (Action P1a) defined in the City's Comprehensive Transportation Plan (adopted May 13, 2014) was to prepare guidelines for preparing and reviewing the traffic impact studies as a qualified part of the review process. The TIA procedural guidelines will address site locations, and off-site improvements necessary to permit the street system to operate at a satisfactory level-of-service. The Action Item concludes with the need to consider input from the local development community and to submit the guideline document for adoption by the City Council. This document provides the elements required for preparing and reviewing Traffic Studies. The purpose of this document is to provide guidance and encourage consistency in planning site access locations, and off-site improvements for new and modified developments through the use of Traffic Studies.

Traffic Studies are invaluable planning tools for the City of Norman by providing review staff with sufficient information concerning the transportation impacts of proposed and future projects and to determine appropriate mitigation measures so as to inform decision-makers so that they make educated decisions within the development review and approval process. The Traffic Study also helps to make the applicant aware of traffic and access conditions that may affect the use of, or benefit derived from the subject property, enabling them to make informed decisions regarding transportation system improvements that may favorably impact their project. Impacts to the transportation system may include, but are not limited to, increased congestion, diminished safety, and conflicts with site access that may require an element of access management.

The Traffic Study will provide guidance for site access and off-site improvements necessary to permit the street system to operate at a satisfactory level-of-service by addressing the following questions:

- What impact will traffic traveling to and from a proposed development have on the operation of the street system adjacent to the site?
- Will the development have safe access to the street system?
- Will the level-of-service of the adjacent street be significantly lower as a result of the proposed development?
- Will internal site traffic safely interact with external entering traffic?

The Traffic Study guidelines presented in this document will perform the following functions:

- Establish standards and consistency of study throughout the City of Norman.
- Ensure that important traffic issues are addressed.
- Ensure that roadways and intersections within the City of Norman remain safe and efficient.

- Promote increased understanding of traffic impact issues for those involved in the development process.

Once approved by the City of Norman, a Traffic Study shall be effective for a period of three years provided the layout of the site has not changed to a more intense level than was evaluated in the original study. Projects that have a multi-year build-out and have demonstrated due diligence toward completing the proposed development shall be exempt from the Traffic Study sunset requirement. Due diligence is defined as a project achieving at least 50 percent of the total project's build-out (in units or size) by the end of the three-year period. Developments seeking permits that have not demonstrated appropriate due diligence and have a Traffic Study in excess of three years old will be subject to City of Norman evaluation. This evaluation is necessary to determine the degree to which background conditions may have changed since approval of the original Traffic Study. A new Traffic Study may be required to provide information to help determine if additional mitigation measures are necessary.

A new Traffic Study will be required if significant changes are made to a development. Significant changes include, but are not limited to, the following:

- Change from a single land use to multiple land uses provided the new land uses generate an additional 100 new peak hour trips.
- Changes from one land use to another that generates an additional 100 peak hour trips.
- Changes from one land use to another where the two land uses have different peaking characteristics.

2.0 TRAFFIC STUDY SCREENING THRESHOLDS

Table 1 illustrates these thresholds for when a traffic study is needed. A minimum of a traffic study memo may be requested even for trip generation of less than 100 peak hour vehicle increases.

Table 1. Typical Traffic Study Screening Thresholds

Development Type	Trip Generation Threshold
Residential	100 vehicle per peak hour increase
Non-Residential	100 vehicle per peak hour increase
Residential Mixed Use (without reductions)	100 vehicle per peak hour increase

Other reasons that a Traffic Study may be required include, but are not limited to:

- An application is submitted to rezone a parcel(s) or change the use of a parcel(s) to allow a more intensive trip generating use.

- The project is located at or near a signalized intersection with traffic movement(s) operating worse than Level of Service D.
- The project will provide a through connection that links collector roadways and/or roadways of higher classification.
- The street segment serving the project does not meet current City of Norman minimum street standards and/or does not conform to acceptable geometric configurations as defined by the City of Norman and/or the Oklahoma Department of Transportation.
- The project is located near a location identified by the City of Norman as a high crash/accident location.
- The City of Norman review staff has specific concerns regarding site access and/or safety issues.

The discretion to require a traffic study relates specifically to the traffic in and out of the proposed development, the traffic load on the arterial, and current and planned configuration of the arterial.

An applicant shall not avoid the intent of this requirement by submitting piecemeal applications or approval requests for subdivision plats, preliminary or site development plans, or building permits. **Figure 1** illustrates the Traffic Study process. Section 4.0 outlines City-provided information for use in a Traffic Study.

2.1 TRANSPORTATION SYSTEM PERFORMANCE POLICY

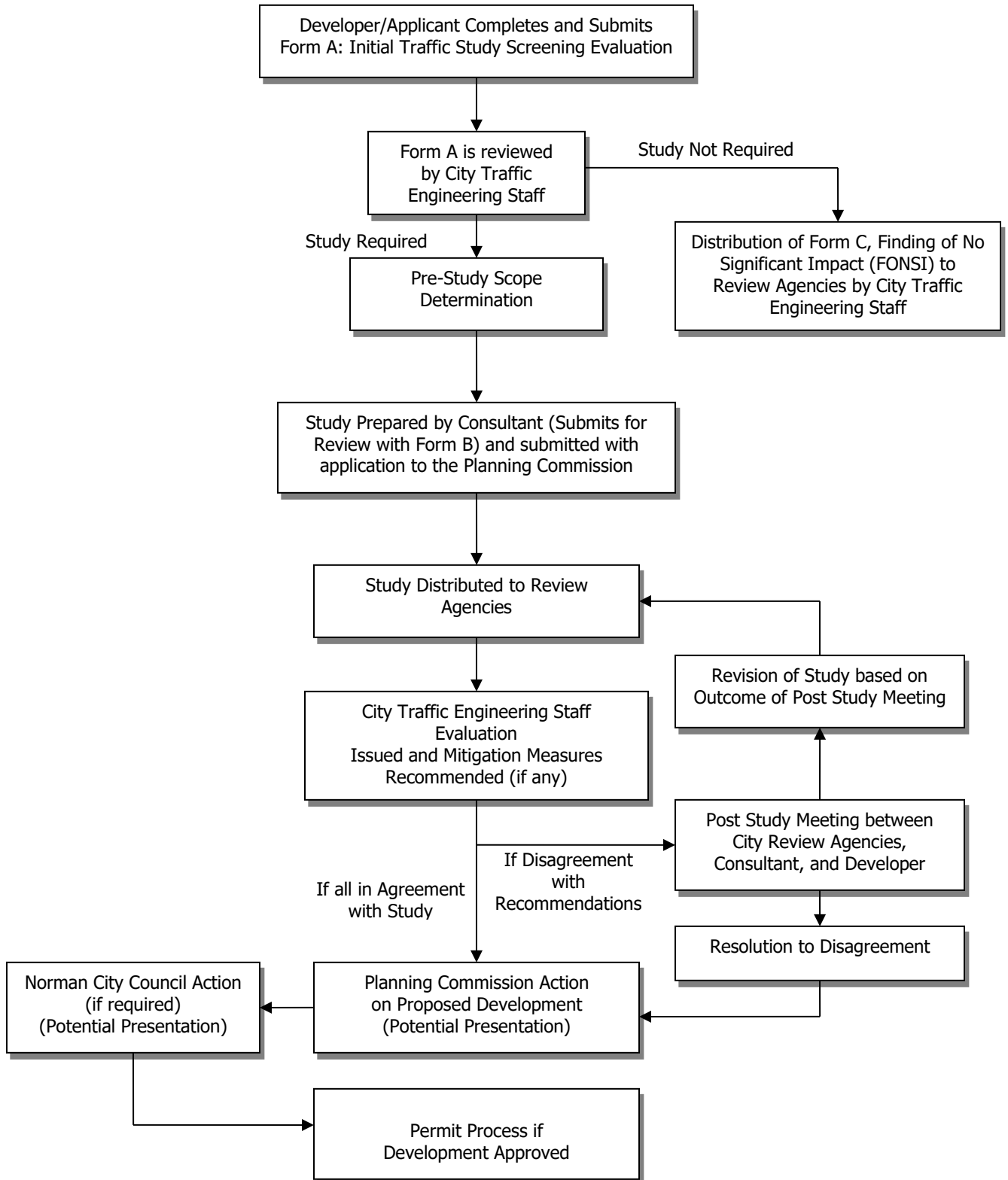
The Level of Service goals for intersections are not regulatory requirements. Instead, these goals are utilized as screening tools to assist in the determination of whether or not the impact of individual projects might be mitigated. Projects whose study area include signalized intersections with movements that operate at no worse than a Level of Service “D” under background conditions will be required to provide mitigation making sure that no movements operate worse than Level of Service “D” under post-development conditions. However, projects whose study intersections include signalized intersections with movements that operate at a Level of Service “E” or worse under background conditions will be required, with the project, to provide mitigation back to the background vehicular delay values for these critical movements.

2.2 TRAFFIC STUDY PREPARER QUALIFICATIONS

The individual completing and/or supervising the preparation of a Traffic Study shall be a registered Professional Engineer (P.E.) in good standing with the State of Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors. Any elements of the Traffic Study that involve roadway or traffic signal design work shall be prepared or supervised by a registered P.E. with specific training in traffic or transportation engineering. Specific Professional Traffic Operations Engineer (PTOE) certification is desired but not required. Each Traffic

Study and/or report submitted to the City of Norman for final review will be sealed by the engineer overseeing the completion of the study(s) and/or document(s).

Figure 1. Traffic Study Review Process



Comments will be provided no later than 15 business days after receipt of a request to review a submitted study. (See Form B)

3.0 TYPES OF TRAFFIC STUDIES

There are three types of traffic studies:

- Traffic Impact Memo
- Traffic Impact Statement
- Traffic Impact Analysis

Table 2 illustrates recommended thresholds that the City of Norman review staff will use as a guide to determine the level or type of study required. The discretion of the City of Norman Public Works Department may be applied to any of the thresholds. These recommended thresholds provide for a more complete evaluation tool to assess the impact of development during the peak travel periods as this is the time of day when congestion is at its worst. Thresholds are based upon recommendations of the Institute of Transportation Engineers. A traffic impact memo may be required when no other traffic study is needed.

Table 2. Traffic Study Thresholds

Traffic Study Type	Threshold
Traffic Impact Memo	Up to 100 peak hour trips
Traffic Impact Statement (TIS)	100-249 new peak hour trips
Traffic Impact Analysis (TIA)	250+ new peak hour trips

3.1 TRAFFIC IMPACT MEMO

When the thresholds for a Traffic Study are not met, a Traffic Impact Memo may be requested. This memo should identify the trip generation potential on an average weekday, during the AM peak hour, and during the PM peak hour. In addition, the memo should address appropriateness of all connections to the public street system. Other items may be added to the requirements of the memo on a case by case basis. Once the need for a Traffic Impact Memo has been determined, the applicant shall provide additional information, identified in **Table 3**, to the City of Norman review staff.

3.2 TRAFFIC IMPACT STATEMENT

Traffic Impact Statements (TIS) evaluate impacts at the site access point(s) and appropriate nearby intersections on a case-by-case basis as determined by the City. The thresholds for conducting the TIS are between 100 and 249 new peak hour trips.

The study boundaries shall include all roadways serving the project, and all intersections up to the first collector roadway or roadway of higher functional classification. This includes those intersections that the City of Norman review staff feels are necessary to provide for an adequate review of the proposed project's impact. The City of Norman review staff, in consultation with the

applicant/developer, will determine the TIS study boundaries and the scope of work for the study during the Pre-Study Scope Determination Meeting. Typical elements to be included in the TIS are identified in **Table 3**.

3.3 TRAFFIC IMPACT ANALYSIS

A traditional Traffic Impact Analysis (TIA) evaluates the impacts at site access points and appropriate nearby intersections. **Table 3** illustrates that the TIA will provide a more robust and in-depth analysis of the impacts of site-generated traffic on the transportation network than the analysis provided in a TIS. The threshold for a TIA is 250 or more new peak hour trips.

The study parameters will include an analysis of the project's access points, an analysis of all roadways serving the project, an analysis of all intersections up to the first collector roadway or the first roadway of higher functional classification, and the intersections of these roadways with arterial roadways. Intersections and roadways away from the proposed site could be in more than one direction. This includes those intersections that the City of Norman review staff feels are necessary to provide for an adequate review of the proposed project's impact. The City of Norman review staff, in consultation with the applicant/developer, will determine the TIA study boundaries and the scope of work for the study during the Pre-Study Scope Determination Meeting.

3.4 AUTHORITY FOR REQUIRING TRAFFIC STUDIES

In some instances, a Traffic Study may be required even though minimum thresholds may not be met. Level of Service screening criteria as well as evaluation of existing and background conditions may be utilized to determine the necessity for a Traffic Study. Crash rates may also be used as a screening tool to help determine the necessity for a Traffic Study. Finally, the applicant may request a Pre-Study Scope Determination Meeting if they feel that a Traffic Study is needed.

3.5 APPLICATION PROCESS

The completed traffic study is to be submitted for review by City of Norman review staff with the application to the Planning Commission. This will allow adequate time for City of Norman review staff to complete a thorough review of the submitted study and to work through any differences that might exist between the City of Norman review staff and the applicant.

4.0 ELEMENTS TO BE ADDRESSED IN A TRAFFIC STUDY

Prior to starting work on a Traffic Study, a Pre-Study Scope Determination is to be held (this can be in person, on a telephone call, or through electronic mail). At this meeting, the City of Norman review staff will determine the type of Traffic Study to

be prepared. The City of Norman review staff will also consult with the developer and/or the consultant preparing the Traffic Study in order to discuss any potential issues and concerns with the project and develop an agreement about the scope of work for the Traffic Study.

The applicant shall bring to the Pre-Study Scope Determination Meeting:

- Form A—Initial Traffic Study Evaluation
- A complete description of the development. This shall include a site map that details land uses, building footprints, the number of units/unit size, access points, internal roadways (if any), streets, proposed sidewalks and bicycle facilities, and the location and number of proposed parking spaces (if applicable). The best available documentation will be sufficient to use during the Pre-Study Scope Determination Meeting. Finalized documents should be submitted, when available, for inclusion in the project file.
- If the development is to be phased, the size, location, and timing of each phase.

The applicant shall also be prepared to respond to the following questions:

- What is the relationship of the development to surrounding land uses i.e. interconnectivity with surrounding neighborhoods, pedestrian and bicycle facilities, accessibility to schools and public facilities, etc.?
- Can the proposed development be served by public transportation? If so, trip generation credits could be considered in special cases.
- Does the design provide facilities for bicycles and pedestrians who need to gain access to, pass by, or pass through the development?
- Is there any other information or material that will facilitate the preparation and accuracy of the Traffic Study?

Typical information that the City should be expected to provide includes, but may not be limited to, the following:

- Traffic signal timing
- Crash data
- Approval of anticipated growth rates

The applicant's Traffic Study preparer will include a complete and accurate analysis of the issues identified at the Pre-Study Scope Determination Meeting. Meeting notes will be prepared by the Applicant and distributed to all participants and any others identified specifically at the meeting. Once all comments from participants have been addressed, final minutes will be distributed to all.

Table 3 illustrates the typical elements that are usually included in each of the different levels/types of traffic studies.

Table 3. Elements of Typical Traffic Studies

Task	Traffic Impact Memo	Traffic Impact Statement	Traffic Impact Analysis
Pre-Study Scope Determination	√	√	√
Impact Analysis:			
Study area and road summary	√	√	√
Site plan that includes: adjacent land uses, driveways, and roadways (existing and dedicated)	√	√	√
Project description to include planned land uses, internal circulation for all modes, site access, etc.	√	√	√
Details of other projects (both approved and permitted) in study area		√	√
Existing conditions analysis (LOS) at site access locations		√	√
Existing conditions at nearby intersections		√	√
Background traffic growth		√	√
Existing conditions + Background traffic (future without project)		√	√
Trip generation for specific uses	√	√	√
Trip distribution analysis		√	√
Future + project conditions analysis at site access locations		√	√
Future + project conditions analysis for nearby intersections		√	√
Mitigation identification and evaluation		×	×
Comparison of trip generation associated with uses allowed, requested vs. current permitted uses			
Sight distance evaluation	×	√	√
Opposing driveway locations	√	√	√
Site Issues:			
Evaluate number, location, and spacing of access points	√	√	√
Access design, queue lengths, etc.		√	√
Site circulation		√	√
Other Analyses:			
Accident/Crash History		×	√
Signal coordination analysis		×	√
Signal warrant analysis		×	√
Turn lane warrant analysis	×	√	√
Consistency with City roadway standards		√	√
Segment/Link Analysis		×	×
Key: √ = required × = may be appropriate on a case by case basis			

Note: LOS = Level of Service as determined by techniques outlined in the *Highway Capacity Manual*.

Adapted from *Evaluating Traffic Impact Studies: A Recommended Practice for Michigan Communities*. Tri-County Regional Planning Commission, 1994.

5.0 SOFTWARE AND DATA

5.1 TRAFFIC ANALYSIS SOFTWARE

The software used will be based on the Transportation Research Board's *Highway Capacity Manual* (HCM) and utilize the HCM's formulae in order to conduct capacity analysis for all transportation system scenarios. The software used must be able to analyze intersection operations including signal timing and phasing analysis, pedestrian calls, queue lengths, and analysis of street segments. The use of multiple software packages is permissible.

Software packages such as *CorSim*, *Vissim*, *Passer*, *Transyt 7-F*, and *Synchro* (not meant to be an all-inclusive list) that perform micro-simulation of traffic dynamics including simulations of transit and heavy vehicle operations, as well as provide graphic descriptions of intersection and link operations are not required but may be utilized. However, data from one of these software packages must be reported in HCM format and meet the basic criteria for exporting data as specified in this document.

Specialized software for transit operations analysis, turning templates, geometric analysis, and noise mitigation analysis may be used separately from the traffic operations analysis software. The use of these types of software packages for analysis of elements included within a Traffic Study submitted to the City of Norman must receive prior approval of the City of Norman review staff.

5.2 COLLISION REPORTS

If needed, collision reports may be obtained from the City of Norman, the Oklahoma Department of Safety, or the Oklahoma Department of Transportation. Accident data for individual roadway segments and locations not provided by one of these agencies listed above will not be accepted. If needed, data shall cover a minimum of a two-year period.

5.3 APPROVED DEVELOPMENTS

Data about properties located within the study area boundaries are available from the City of Norman. Applicants are to identify any approved development and use this information in the completion of their traffic study. Data available includes: all subdivision plats, planned unit developments, zoning, construction permits, and any conditions of approval associated with them. If available, the conditions of approval shall be included in the study analysis. In addition, the consultant may be asked to generate traffic for undeveloped tracts of land in proximity to the subject site for the purposes of determining appropriate shares for construction of recommended improvements. The City of Norman will make a copy of traffic studies for approved developments within the study area boundaries available to the consultant.

5.4 AVERAGE DAILY TRAFFIC (ADT) COUNTS

The Oklahoma Department of Transportation, the Association of Central Oklahoma Governments (ACOG), or the City of Norman Average Daily Traffic (ADT) counts may be utilized, if available, to assist in the determination of a roadway's historic annual growth rate. The consultant shall provide documentation of the methodology used to determine the growth rates within the Traffic Study document. These growth rates should be presented for approval for use in the Traffic Study.

ADT counts may also be utilized to determine the amount of traffic entering and exiting the study area and may also be used to verify counts collected by the consultant. The most recent ADT should be used. However, traffic counts that are more than two (2) years old may not be used except to determine historical trends.

5.5 INTERSECTION TRAFFIC VOLUMES

Turning movement counts must have been collected within two (2) years prior to submittal of a traffic study. Counts shall be collected on school days, and when necessary because of the land use being requested, on weekends and off-peak periods to include mid-day and evenings. If turning movement counts for the study intersections are not available through the City of Norman review staff, the consultant will be required to collect this data for at least the A.M. and P.M. peak travel periods. A printed summary of the data should be included as part of the report. The summary will include intersection drawings with lane configurations, intersection composite and individual turning movement peak hour factors, heavy vehicle percentages (if required), and traffic signal phasing (if applicable). See section 4.0 for a list of typical information to be provided by the City. Form D should be submitted as a traffic count permit.

5.6 MANUALS AND GUIDANCE DOCUMENTS

The most recent versions of the Institute of Transportation Engineers' (ITE) *Trip Generation* and the Transportation Research Board's *Highway Capacity Manual* shall be used. In some cases, a proposed land use may not be contained within *Trip Generation* and the companion *Trip Generation Handbook*. In those cases, it is acceptable for trip generation to utilize characteristics based on local data specific to a particular location or land use subject to approval by the City of Norman review staff. If these observed trip generation rates result in rates lower than predicted by *Trip Generation* for a similar use, the study must analyze the differences. For example, if observed trip rates suggest that vehicular trips will be lower because of the location of a specific site because more trips will be made as pedestrian or bicycle trips, then the study should evaluate the ability of the study area to accommodate these additional pedestrian and/or bicycle trips. *Trip Generation* contains guidelines specific to the collection of trip generation data.

The rates and formulae, intended for use in this traffic study, must have been derived using the ITE *Trip Generation* study methodology.

Other documents to be used are the City of Norman's Comprehensive Transportation Plan, the City of Norman's Zoning and Subdivision Regulations, City-adopted plans, current Major Street and/or Collector Plans, current plans for Sidewalks and/or Bicycles, the City of Norman Capital Improvements Budget, City of Norman Department of Public Works project schedules, Oklahoma Department of Transportation project schedules, and any documents identified by the City of Norman review staff as being necessary.

5.7 SIGNAL TIMING PLANS

The City of Norman, upon request, will provide the consultant with current signal timing plans for signalized intersections within the study area. In those instances where a signalized intersection is part of a coordinated system, data for the system will also be provided including the City-adopted common cycle lengths.

5.8 TRANSPORTATION IMPROVEMENT PLAN AND OCARTS PLAN

The Transportation Improvement Program and the Oklahoma City Area Regional Transportation Study (OCARTS) Plan may be obtained from the ACOG. These documents shall be consulted in order to determine what projects and/or transportation improvements are planned for an area or specific location and also to determine when the project is funded and might be completed. The City shall confirm all future projects and the schedules associated with these projects.

6.0 CAPACITY ANALYSIS

The applicant's Traffic Study preparer shall use either a generalized growth rate or a facility specific growth rate in order to derive background traffic volumes to be used in the capacity analysis. The consultant may be provided growth rates at the Pre-Study Scope Determination Meeting or instructed to derive growth rates using historic traffic volume data and linear regression techniques. If the growth rate is derived rather than provided, the consultant must document all data and calculations within the study.

A Traffic Study is basically a before and after analysis. Following are the basic scenarios of capacity analysis for study intersections and affected roadways.

6.1 EXISTING TRAFFIC

It is important to identify the existing operating conditions of the study area intersections and roadway segments in order to determine existing deficiencies in the transportation system and to allow a comparison with future conditions.

6.2 BACKGROUND TRAFFIC

A Traffic Study is not prepared in a void as existing traffic will continue to grow even if the proposed project does not develop. Projects that have an opening date at least one (1) year away will be impacted by background traffic. Background traffic consists of the natural traffic growth (traffic from approved projects or potential growth and population growth) without the proposed project. An analysis of this increased traffic shall be conducted in order to determine the future operating conditions of the roadway at the planning horizon without the project.

6.3 PROJECT TRAFFIC

An analysis of the traffic associated with the proposed development is a requirement of each of the different types of Traffic Study described in this document. A “trip generation” for the project is conducted in order to complete this analysis. A trip is defined as a single, one-way movement. Sources for trip generation are listed in Section 5.7 of this document. *Trip Generation* frequently provides more than one method for determining the number of site related trips. When provided, the Traffic Study shall utilize the fitted curve formula for determining project trip generation if the development size is within the data extremes. Otherwise, the use of the average trip rates is considered to be acceptable. During the analysis of project traffic, access and internal circulation shall be evaluated as well. Reductions in generated trips shall be conducted in good faith and shall utilize ITE approved data and methodologies for pass-by trips and internal capture.

Trip distribution and assignment methods shall be approved by the City of Norman review staff prior to distributing traffic to the roadway network and reducing the number of trips for a proposed project in a Traffic Study.

6.4 FUTURE TRAFFIC

This is the “after” portion of the Traffic Study process that was described previously. Analysis of the future traffic conditions includes examination of the background traffic for the study area increased by the project traffic volumes.

7.0 MITIGATION

Mitigation measures, if determined to be required, must be included as part of the Traffic Study. This determines if a project’s impact can be eliminated or reduced to an insignificant level. It is recognized that a specific proposed development may not, by itself, create an impact, but that an inadequacy would exist regardless of whether or not the property were to be developed. In those situations where the pre-development Level of Service is not acceptable, then local participation may be necessary in order to assure that acceptable levels of service are achieved in the post development scenario. Depending on what the background Level of

Service is, this will involve mitigation back to the background Level of Service or no worse than Level of Service “D” (see Section 2.1). Identification of necessary mitigation does not determine the responsibility for such improvements only that the improvements are necessary. The mitigation criterion takes prevailing conditions into account when assessing the required level of mitigation.

The Traffic Study shall identify all impacts by lane group and evaluate suitable measures that mitigate the impact or return to projected pre-development conditions to what they would be if the proposed action were not in place or to acceptable levels. The following criteria shall apply:

- When existing plus cumulative traffic with planned and background improvements exceed established Level of Service criteria (provided in Section 2.1 of this document), the applicant shall identify mitigation necessary to offset project impacts. In this example, the total signalized intersection shall not operate at a Level of Service worse than “D” under future traffic conditions and no individual movement is allowed to operate at a Level of Service “F”. In other words, the applicant is required to mitigate all impacts of the proposed project.
- When existing plus cumulative traffic with planned and background improvements do not exceed established Level of Service criteria (provided in Section 2.1 of this document), the applicant shall identify mitigation to achieve established Levels of Service. In this example, no movement at a signalized intersection under future traffic conditions would operate at a Level of Service worse than it did under background conditions. In other words, the applicant must mitigate back to the background Level of Service.
- It is important that the Traffic Study identify all mitigation measures necessary for proper mitigation regardless of responsibility.

7.1 **MITIGATION MEASURES**

The major benefit of a Traffic Study is to determine what, if any, mitigation measures are needed. These measures are not limited to roadway construction or other physical improvements. Mitigation can involve anything from physical or operational improvements along the roadway and site access points, to programs and incentives designed to specifically alter travel behavior, or any combination of these. They may also include alteration of the proposed development to reduce the number of peak hour trips generated or even denial of the project altogether. **Table 4** presents some examples of mitigation measures. The CMP document developed by the OCARTS also contains a list of tools and strategies that can be applied to address congestion caused by specific situations.

Table 4. Examples of Mitigation Measures

Mitigation Category	Mitigation Measure
Roadway Improvements	<ul style="list-style-type: none"> • Repaving/re-striping • Realignment of streets • Improve Sight Distance • Widening • Intersection Improvements • Acceleration/deceleration lanes • Traffic signals (must meet warrants) • Median crossovers • Building new roadways • Interchanges (construct or modify), etc.
Access Management Improvements	<ul style="list-style-type: none"> • Increase driveway spacing • Relocate driveways or intersections • Reduce the number of driveways • Install medians • Shared access, etc.
Operational Improvements	<ul style="list-style-type: none"> • Modify signal timing or phasing • Improve signal progression • Increase transit operations • Provide incentives for transit use, etc.
Site Plan/Land Use Improvements	<ul style="list-style-type: none"> • Reduce project size • Modify project phasing • Increase driveway queuing • Revise/improve internal circulation • Revise service vehicle/truck access or circulation • Improve pedestrian and bicycle access and circulation • Improve way-finding through directional signs and pavement markings, etc.
Travel Demand Management	<ul style="list-style-type: none"> • Staggered work hours • Car pooling • Telecommuting, etc.

Adapted from *Evaluating Traffic Impact Studies: A Recommended Practice for Michigan Communities*. Tri-County Regional Planning Commission, 1994.

7.2 TURN LANES

Turn lanes shall be designed to accommodate either demand or deceleration requirements, as applicable. Left-turning and right-turning movements at unsignalized intersections shall be analyzed using locally approved methodologies

in order to determine the spacing needs for left-turn and/or right-turn bays. These analysis methodologies shall conform to methodologies approved and/or recommended by the most recent edition of the *Highway Capacity Manual*. Left-turn lanes shall be provided on arterial approaches at all intersections proposed for traffic signal installation. Right-turn Bays are required at driveway intersections that will serve at least 100 peak hour right-turning vehicles. The consultant shall also conduct a queue length analysis using the *Highway Capacity Manual* method in order to determine the adequacy of turn bays for both left- and right-turning movements. Turn bays shall be sized to accommodate the 95th percentile confidence level and shall be designed in accordance with the most recent edition of the American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets* (Green Book).

7.3 PRESENTING MITIGATION MEASURES

The consultant shall identify, analyze, and discuss mitigation measures in the Traffic Study. These mitigation measures shall be specific and feasible actions whose implementation will improve adverse transportation conditions. A mitigation measure shall adequately avoid, minimize, rectify, reduce over time, or compensate an impact. All mitigation measures that require roadway widening shall be submitted on an aerial photograph or surveyed plan. The exhibit may include a generalized drawing of the proposed mitigation and shall show existing conditions, property lines, and geographical conditions. This exhibit shall be drawn to a scale that allows the City of Norman review staff to determine the feasibility of the proposed mitigation. The mitigation measures shall consider the following:

- Scheduled improvements
- The phasing of the project's development
- A logical phasing of improvements
- Responsibility for implementation
- Generalized cost estimates (engineering design, utility relocation, right-of-way acquisition, and construction)

7.4 RESPONSIBILITY FOR MITIGATION

The City of Norman operates under the "proportionate-share" concept for implementation of mitigating improvements to offset proposed developments. The "proportionate-share" concept assigns funding responsibilities for mitigation measures based on the relative contribution of traffic generated by a given development on a specific roadway or intersection. The City of Norman is committed to providing its "proportionate-share" of traffic mitigation costs (including right-of-way acquisition costs) caused by a project, but it is not responsible for providing mitigation funding beyond its impact level. Pursuant to the U.S. Supreme Court Nollan and Dolan cases, there must not only be a link between the impact generated by a project and the mitigation required of it but there must be rough proportionality between the two as well. The City of Norman's mitigation program is designed to ensure that this link is maintained.

Improvements must be in place and/or appropriate fees paid prior to the filing of the final plat. An exception would be a development that is surrounded by undeveloped land. The development of these currently undeveloped lands also must contribute the cost of the roadway improvements to avoid a situation where the proposed development pays the way for future developments. As stated previously, mitigation costs and/or efforts must be discussed within the Traffic Study. This would include identification of the proportionate share, based on the number of peak hour trips generated by existing and background traffic conditions, of the various interests, including the City of Norman, within the study area. The City of Norman review staff, in collaboration with the consultant and the developer, will make the final recommendation of the appropriate measures including the timetable for implementation.

8.0 REPORT PRESENTATION AND CONTENTS

Any Traffic Study submitted for review shall follow a pre-determined format as shown in **Part A, Recommended Report Outline**. This format is intended to provide consistency in preparation and review of each Traffic Study. The City of Norman review staff, along with other reviewing agencies, will evaluate and comment on the initial Traffic Study over a period not to exceed fifteen (15) business days. The consultant will make any necessary revisions and submit the final Traffic Study, if necessary, to the City of Norman review staff for acceptance. It is the intent of this document to provide sufficient guidance that would minimize the number of draft versions of the Traffic Study so that comments can be provided in a timely manner allowing projects to proceed efficiently through the development review cycle.

The consultant shall provide to the City of Norman review staff an electronic copy of the Traffic Study's final documents. Only physical copies are required of draft documents. Electronic copies of the final document, including all technical appendices, shall be provided to the City of Norman review staff in Adobe portable document format (PDF).

A Civil or Traffic Engineer, who is currently registered and in good standing with the State of Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors, shall seal the final report. PTOE registration is desirable but not required.

The final report will meet the following requirements:

- The report shall clearly identify the name of the development (any past names as well), the applicant, and any City of Norman case number, if applicable.
- The report shall clearly state the purpose and objective of the study.
- The report shall be presented in a clear and logical sequence. It shall lead the reader step-by-step through the various stages of the process. It will clearly state the conclusions of the study and the resulting recommendations. It shall include graphics, tables, and charts to clearly identify the project, the project location, proposed project phasing, impacts, issues, and solutions.
- All computerized analysis output sheets and supporting raw-count data, ADT, turning movements, queue length analysis, level of service calculations, intersection delay data, etc. shall be included in technical appendices to the report. All assumptions used in the calculations must be referred to in the appropriate tables, chart, or page in approved publications (e.g. volume/capacity ratios, vehicle operating speeds, trip generation rates, etc.). Calculations must be comprehensive, clear, and easy to follow.
- All maps and graphics involving improvements must be drawn to a scale that allows roadway geometrics to be approximately dimensioned (e.g. road width, lane width, 95th percentile confidence level queue length, etc.) and allows the City of Norman review staff to accurately evaluate them. Intersection geometrics must include bus stops, parking areas, pedestrian crossings, driveways, turn restrictions, existing right-of-way, etc.
- The Traffic Study shall identify traffic congestion, safety problems, and/or other deficiencies of the future transportation system across all modes, with and without the proposed development (i.e. lack of pedestrian and/or bicycle facilities, insufficient transit service, etc.). The study shall incorporate identified and/or planned transportation improvements being made by other public agencies (e.g. Oklahoma Department of Transportation, City of Norman, Cleveland County, etc.) or private organization that are funded and expected to be functional by the planning horizon of the study.
- Descriptions of on-site issues including number and location of driveways, circulation, bicycle and pedestrian facilities, truck access and operations, transit, and safety shall be presented. The City of Norman review staff may request that a discussion of parking needs and presentation of parking layout/issues be presented in the study.
- The report will address left-turn lanes and right-turn lanes utilizing local approved methodologies for analyzing the need for exclusive turn lanes. Turn bays shall be sized to accommodate either the 95th percentile confidence level queue length as determined by the current edition of the *Highway Capacity Manual* method or deceleration requirements, as applicable. Design shall be in accordance with the current edition of the AASHTO Green Book.
- The report shall evaluate potential improvement measures needed in order to mitigate the impact of the development to the background delay levels or to the Level of Service standards identified earlier in this document.

- The Traffic Study shall contain recommendations for site access and transportation improvements needed to maintain traffic flow to, from, within, and past the site at an acceptable and safe Level of Service. An evaluation of sight distance availability in accordance with AASHTO Green Book standards is to be included for each new or modified intersection. Spacing of access points shall be compared with the minimum requirements in the EDC. Discussion should focus on how the number of access points can be minimized rather than on maximizing the number allowed by the EDC based upon the site frontage. A development will be granted only as many access points as may be needed to adequately serve the proposed development.
- Description of coordination efforts with affected jurisdictions outside of the City of Norman's purview shall be included as may be necessary. Coordination efforts should minimally include correspondence with the affected jurisdiction to inform them about the Traffic Study and the proposed development. Other coordination could include providing the affected jurisdiction with a copy of the Traffic Study, providing a written invitation to the affected jurisdiction to participate in the Traffic Study review process, or providing City of Norman review staff with the contact information for their counterparts in the affected jurisdiction. Coordination efforts should be pursued when a development crosses jurisdictional boundaries or is directly adjacent to another jurisdiction and the majority of the distributed traffic from the development will impact the roadways of the adjacent jurisdiction.
- Daily trips may be reduced to account for ridesharing, transit use, and complementary land uses. However, assumptions about ridesharing, transit use, and land use must be supported with quantifiable data. Such data might include rideshare percentages for similar development, mode split percentages for the study area, demographic data, and internal capture analysis. Trip reductions shall be presented clearly and all assumptions and calculations should be included in one of the Traffic Study's technical appendices.
- The use of peak hour adjustment factors does not eliminate traffic volume. It assumes that there is less peaking in a single hour and that peaking tendencies are spread over time. Changes to peak hour adjustment factors are allowed only with the prior permission of the City of Norman review staff.
- Pass-by factors are to be used to reduce the estimated additional total daily traffic to streets serving a proposed development. They are not to be applied to directly reduce trip generation and turning movement volume at driveways or intersections serving the proposed development.

The consultant may be required to prepare and present a summary of the Traffic Study to the Planning Commission or to the City Council. If the project is deferred for action by the Commission/Council because of inquiries from Commission/Council members, elected officials, or the public, the consultant shall revise the presentation to address the identified issues and be available to offer the revised presentation.

The recommended report outline is presented in **Part A, Recommended Report Outline**.

8.1 FORMS

Part B contains the checklist of the items to be brought to the Pre-Study Scope Determination Meeting as well as the forms that are part of the traffic study process. Form A is the Initial Traffic Study Screening Evaluation that is to be submitted with each request for a Pre-Study Scope Determination Meeting. Form B is the Request for Review/Comments of a Traffic Study that the traffic study preparer can submit with each traffic study prepared for review by City of Norman review staff. Form C is the Finding of No Significant Impact form which will be issued by City of Norman review staff in the event it is determined that a traffic study is not required for a particular application. Form D is the traffic count permit form.

PART A
RECOMMENDED REPORT OUTLINE

Recommended Outline for Traffic Study Final Report

- A. Executive Summary
 - 1. Summary of project scope
 - 2. A brief description of the proposed development
 - 3. Identification of the proposed development site
 - 4. Summary of the major findings of the analysis
 - 5. Identification of mitigation measures and recommendations
- B. Background
 - 1. A vicinity map showing the location of the proposed development in relation to the study area's transportation system
 - 2. A complete project description
 - 3. The proposed site plan
 - a. Includes the existing land uses and
 - b. Proposed site uses complete with size, land uses, and phasing
 - 4. The proposed location and traffic control of all proposed access points
 - 5. A brief description of the current (and proposed, if applicable) land uses adjacent to the site
 - 6. A description of the study area as defined during the Pre-Study Scope Determination Meeting
 - a. All proposed site access points
 - b. Roadway names, locations, and functional classifications
 - c. Existing roadway conditions, intersection locations, and Levels of Service
 - d. Intersection lane configurations and traffic control
 - e. Pedestrian, bicycle, and transit facilities
 - f. Anticipated nearby land development (approved, permitted, or under construction) and the associated traffic
 - g. Overall traffic growth in the area
- C. Existing Conditions Assessment
 - 1. Existing traffic volumes (measured within the previous two (2) years) and operational analysis for all study intersection and roadway segments
 - a. Signal timing cycles
 - b. Level of Service(include vehicle delay/failing approaches for unsignalized intersections)
 - c. Queue length analysis
 - d. Transit accessibility
 - e. Identification of bicycle and pedestrian facilities
 - f. High crash/accident locations
 - 2. Capacity analysis outputs for the existing conditions shall be included as an appendix to the report

- D. Background Traffic Assessment
1. Background traffic volumes shall be forecast to the project horizon. Forecasts may utilize a straight-line regression of historical traffic volumes or apply a compound growth factor model.
 2. Background traffic volumes shall incorporate existing traffic volumes that have been measured within the two (2) previous years and traffic generated from anticipated nearby land development i.e. projects approved/permitted within the last five (5) years, or currently under construction.
 3. Background traffic shall be forecast to the project's horizon for completion (if the project is phased, then forecasts shall be to each of the phase horizons).
 4. Operational analysis for all study intersections and roadway segments
 - a. Level of Service (include vehicle delay/failing approaches for unsignalized intersections)
 - b. Queue length analysis
 - c. Transit accessibility (if applicable)
 - d. Identification of bicycle and pedestrian facilities (if applicable)
 5. Capacity analysis outputs for the background conditions shall be included as an appendix to the report
- E. Trip Generation
1. Complete trip generation estimates for all phases and land uses of the proposed development
 - a. Use the most recent edition of the ITE *Trip Generation* manual and the companion *Trip Generation Handbook*
 - b. The specific trip generation figures that are used for calculations shall be identified in a tabular format in the report
 - c. Within *Trip Generation*, some land uses utilize an average trip rate while others utilize a fitted curve equation to predict the number of trips to be generated. In the event a given land use has both options available, the consultant shall clearly identify in the report the methodology utilized.
 2. If the consultant or the City of Norman review staff feels that the *Trip Generation* manual does not contain adequate data or that the land use is unique in its trip generation characteristics, a trip generation study can be conducted and its results used in place of the *Trip Generation* manual. This is subject to approval by the City of Norman review staff. *Trip Generation* contains guidelines specific to the collection of trip generation data. The rates and formulae, intended for use in this traffic study, must have been derived using the ITE *Trip Generation* study methodology.

- F. Trip Distribution and Assignment Assessment
 - 1. Trip distribution of the trip generation information shall be performed using the existing distribution patterns. Trip distribution may be conducted using a surrogate methodology. Such methodologies could include the use of market analysis studies, population, and/or employment distributions within a buffered area around the project site. A figure of the trip distribution shall be provided.
 - 2. Trips shall be assigned to the roadway network based on the trip distribution. Assignment of trips to project access points shall be logical and assume that trips will take the shortest and/or most direct route to destinations within the project site and adjacent roadways and trips will seek to maximize right-turning movements. A figure of the trip assignment shall be provided.
- G. Future Traffic Assessment
 - 1. Analysis of future traffic conditions shall include project traffic (not reduced unless approved by the City of Norman review staff) added to background project traffic
 - 2. Operational analysis for all study intersection and roadway segments
 - a. Level of Service (include vehicle delay/failing approaches for unsignalized intersections)
 - b. Queue length analysis
 - c. Signal timing cycles
 - d. Transit accessibility (if applicable)
 - e. Identification of bicycle and pedestrian facilities (if applicable)
 - 3. Capacity analysis outputs for each project phase (if more than one) shall be included as an appendix to the report
- H. Site Access Analysis
 - 1. Safety analysis of the proposed site access points including sight distance (both stopping sight distance and intersection sight triangle) and operational characteristics shall be conducted
 - 2. Analysis of right- and left-turn lane warrants, queue lengths, storage/throat lengths, acceleration and deceleration lanes, channelization, and other characteristics of site-access driveways, as applicable
- I. Safety Analysis—High accident locations shall be evaluated when adequate information for analysis is readily available. The analysis shall include collision diagrams and accident rates and use at least two (2) years of collision data.
- J. Mitigation Analysis
 - 1. The mitigation analysis shall evaluate the future traffic conditions with proposed mitigations to improve operations and/or deficiencies, if any
 - 2. Operational analysis for all study locations
 - a. Level of Service (include vehicle delay/failing approaches for unsignalized intersections)

- b. Identification of revised lane geometry/lane configuration (include diagram)
 - c. Queue length analysis
 - d. Signal timing cycles
 - e. Transit accessibility
 - f. Identification of bicycle and pedestrian facilities
 - g. Analysis of new connections opportunities/issues
 - h. Discussion of additional connectivity opportunities/issues
 - 3. All mitigation measures that require roadway widening and/or additional right-of-way acquisition shall be submitted on an aerial photograph or surveyed plan showing existing conditions, property lines, geographic conditions, and the proposed mitigation. This exhibit shall be drawn to a scale that allows for determining the general feasibility of the proposed mitigation.
 - 4. Capacity analysis outputs for each of the assessment scenarios shall be included as an appendix to the report
- K. Conclusions and Recommendations
- 1. A summary of the existing conditions, the background conditions, and the future project conditions
 - 2. Description and summary of mitigation measures necessary to bring the study intersections and roadway segments into compliance with acceptable Levels of Service in accordance with City of Norman transportation policies. Included in the analysis shall be the identification of signals, turn lanes, and other warrants as applicable.

PART B
FORMS

Pre-Study Scope Determination Check-List

(Please ensure that the following items are available for discussion:)

- A. Complete description of the development that includes:
 - 1. Site map detailing:
 - a. Building footprints
 - b. Number of units/unit size
 - c. Access points
 - d. Internal roadways (if any)
 - e. Adjacent streets
 - f. Proposed sidewalks and bicycle facilities (if applicable)
 - g. Location and number of proposed parking spaces (if applicable)

The best available documentation will be sufficient to use during the Pre-Study Scope Determination Meeting. Finalized documents should be submitted, when available, for inclusion in the project file.

- 2. Phasing plan (if applicable) that includes:
 - a. Phase size
 - b. Phase location
 - c. Phase timing
- B. Please be prepared to respond to the following questions:
 - 1. What is the relationship of the development to surrounding land uses (i.e. interconnectivity with surrounding neighborhoods, pedestrian and bicycle facilities (if applicable), accessibility to schools and public facilities, etc.)?
 - 2. Can the proposed development be served by public transportation (if applicable)?
 - 3. Does the design provide facilities for bicycles and pedestrians (if applicable) who need to gain access to, pass by, or pass through the development?
 - 4. Are there any other items/materials that will facilitate the preparation and accuracy of the Traffic Study?

FORM A—INITIAL TRAFFIC STUDY SCREENING EVALUATION

City of Norman Traffic Study Screening

Submit this form to the City of Norman review staff in advance of requesting a Pre-Study Scope Determination Meeting. Its purpose is to help determine the need for a Traffic Study, and if so, the type of study to be conducted. The City of Norman review staff will notify the applicant if a Pre-Study Scope Determination needs to be scheduled.						
Date Submitted:		Codes or Planning Case No.:				
City of Norman Review Staff Contact Information:				Phone:		
				E-Mail:		
Project Name and Location (specific):						
Nearest Major Cross Streets and Functional Classification:						
Applicant or Project Developer:					Phone:	
Traffic Study Preparer:					Phone:	
Has a study been prepared for this location within the past 5-years?		<input type="checkbox"/> Yes <input type="checkbox"/> No		Date:		Title/Case No.:
Include the Following Materials with this Form (Unless this is a Rezoning) Two sets of site plans showing all existing and proposed structures, parking and loading areas, Driveways, sidewalks and bicycle paths/lanes, and on/off site circulation.						
Screening Thresholds	Traffic Impact Memo (up to 100/pkhr)	Traffic Impact Statement (100-249/pkhr)		Traffic Impact Analysis (>250/pkhr)		
Please Complete Prior to meeting						
Trip Generation Calculation						
	Zoning District (List Each District) Use Additional Sheet if Necessary	Land Use (List Each Use) Use Additional Sheet if Necessary	Project Size (Square Feet or Dwelling Units)	Peak Hour Trips		Daily Trips
				AM	PM	
Existing						
Total						
Proposed						
Total						
Net Increase/Decrease (+ or -) Above/Below Existing Trips						
City of Norman Review Staff Comments:						
Recommended Traffic Study Type (circle one)		None (Issue Form B)		Traffic Impact Memo		Traffic Impact Statement
						Traffic Impact Analysis

Evaluated By: _____ Phone: _____

Signature: _____ Date: _____

FORM B—REQUEST FOR REVIEW/COMMENTS OF TRAFFIC STUDY City of Norman Traffic Study Review

A traffic study has been prepared. The City of Norman review staff is requested to provide a review of the attached study for the proposed project. The agreed upon study scope is also attached for verification.

Date Submitted:	Codes or Planning Case No.:	
City of Norman Review Staff Contact Information:		Phone: _____
		E-Mail: _____
Project Name and Location (specific): _____		
Nearest Major Cross Streets: _____		
Project Developer or Property Owner: _____		
Traffic Study Preparer: _____		Phone: _____
Address: _____		E-Mail: _____
Description of Project:		
The following materials are included with this Request for Review		
<input type="checkbox"/> Pre-Study Scope Determination Notes (Project Scope) <input type="checkbox"/> Completed Development Review Application (if not yet completed, provide an approximate date when applications are anticipated to be submitted) <input type="checkbox"/> Traffic Study (studies should be sealed by a P.E.) <input type="checkbox"/> Site plan <input type="checkbox"/> Background information (i.e. existing conditions, adjacent land uses, recent development Activity, planned/programmed improvements, etc.)		
Request Sent by: _____		Phone: _____
Signature: _____		Date: _____
Received by: _____		Phone: _____
Signature: _____		Date: _____
<input type="checkbox"/> Recommended for Approval: <input type="checkbox"/> Recommended for Approval with Conditions: <input type="checkbox"/> Additional Information/Revision Needed: <input type="checkbox"/> Recommended Denial:	Comments:	

City of Norman Reviewer (Signature)

FORM C—FINDING OF NO SIGNIFICANT IMPACT
City of Norman Traffic Study Screening

Date Issued:		Codes or Planning Case No.:	
City of Norman Review Staff Contact Information:		Phone:	
		E-Mail:	
Project Name and Location (specific): _____ Nearest Major Cross Streets: _____ Applicant or Property Developer: _____ Phone: _____ Traffic Study Preparer: _____ Phone: _____			
Description of Project:			
The City of Norman review staff has reviewed the Initial Traffic Study Evaluation of this project and has found that the traffic impacts will likely not significantly impact the transportation system. A traffic study will not be required.			
City of Norman Review Staff Comments:			

Evaluated by: _____ **Phone:** _____
City of Norman Reviewer (Print)

Signature: _____ **Date:** _____

Title:

- ☐ **Original**
- ☐ **Interdepartmental Copy**
- ☐ **Departmental Copy**
- ☐ **Applicant Copy**
- ☐ **File Copy**

This form will be returned to you by the City of Norman review staff if no traffic study is required. Additional comments, if necessary, will be provided at the earliest possible date, but not later than fifteen (15) business days after receipt of this request.



CITY OF NORMAN
Public Works Department
FORM D—PERMIT TO COUNT TRAFFIC
IN CITY RIGHT-OF-WAY

Date: _____

Contractor Name: _____

Address: _____

City/State/Zip: _____

Telephone: _____ **Fax:** _____

E-mail: _____

Count Location: _____

Count Dates: _____

Type of Count (Check all that apply)

- ☐ **Peak Hour Turning Movement Count**
- ☐ **Peak Hour Pedestrian Count**
- ☐ **24-hour Volume Count**
- ☐ **Speed Study**
- ☐ **Gap Study**
- ☐ **Delay Study**

Fax to: City of Norman Traffic Control Division 405-292-9765
Additional questions please telephone 405-329-0528

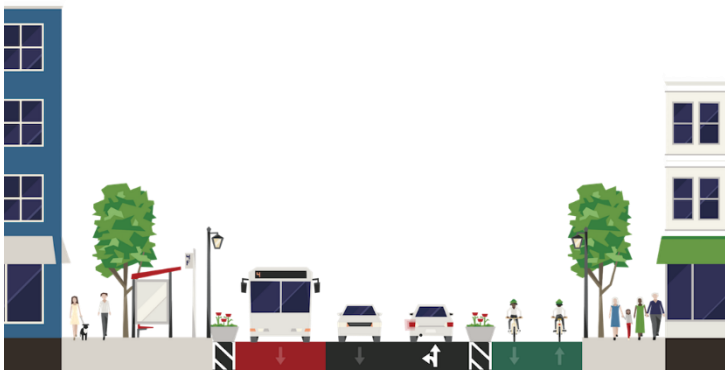
Form D to be submitted one week prior to count activities with approval within 48 hours.

APPENDIX B

Complete Streets Manual

City of Norman

Complete Streets Design Manual



October 2022

Complete Streets Manual Review Meeting Schedule

Acknowledgements.....	February 23
Chapter 1: Introduction	February 23
Chapter 2: Street Networks and Classifications.....	March 9
Chapter 3: Traveled Way Design.....	April 9
Chapter 4: Intersection Design.....	July 13
Chapter 5: Universal Pedestrian Access.....	August 3
Chapter 6: Pedestrian Crossings.....	August 17
Chapter 7: Bikeway Design.....	September 15
Chapter 8: Transit Accommodations.....	September 28
Chapter 9: Traffic Calming.....	October 26
Chapter 10: Streetscape Ecosystem.....	November 23
Chapter 11: Replacing Streets—Putting the Place Back in Streets.....	January 6
Chapter 12: Designing Land Use Along Living Streets.....	January 6
Chapter 13: Retrofitting Suburbia.....	February 3
Chapter 14: Community Engagement for Street Design.....	February 29

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CONTEXT

A growing number of communities are discovering the value of their streets as important public spaces for many aspects of daily life. People want streets that are safe to cross or walk along, offer places to meet people, link healthy neighborhoods, and have a vibrant mix of retail. More people are enjoying the value of farmers' markets, street festivals, and gathering places. In addition, more people want to be able to walk and ride bicycles in their neighborhoods.



Lively Street (Credit: David Riesland)

People from a wide variety of backgrounds are forming partnerships with schools, health agencies, neighborhood associations, environmental organizations, and other groups in asking their city councils to create streets and neighborhoods that fit this vision. As a result, an increasing number of cities are looking to modify the way they design their streets but are often stifled by standards and guidelines that prevent them from making the changes sought. Los Angeles County, California, created an on-line template whereby any entity could customize a Complete Streets Manual using limited resources. The authors felt that by making their work widely available, many more communities will fulfill their dreams in making and remaking their streets valuable public space that serves many needs.

LEGAL STANDING OF STREET MANUALS

Local jurisdictions generally follow some established standards for designing streets. Much confusion exists as to what they must follow, what is merely guidance, when they can adopt their own standards, and when they can use designs that differ from existing standards. The text below untangles the myriad of accepted design documents. It is critical for cities and counties to understand how adopting this manual meshes with other standards and guides. The most important of those standards and guides are the following:

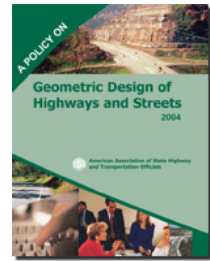
- The American Association of State Highway and Transportation Officials' (AASHTO) *A Policy on Geometric Design of Highways and Streets* (the "Green Book")
- The Oklahoma Department of Transportation Roadway Design Standards
- The City of Norman Engineering Design Criteria
- The City of Norman Comprehensive Transportation Plan
- The *Manual on Uniform Traffic Control Devices* (MUTCD)
- The Oklahoma Fire Code
- The Oklahoma State Vehicle Code

A discussion of the federal-aid roadway classification system helps to frame the requirements of each of these documents. Local governments that wish to use certain federal funds must use a street classification system based on arterials, collectors, and local streets. These funds are for streets and roads that are on the federal-aid system. Only arterials and certain collector streets are on this system. In Chapter 2, "Street Networks and Classifications," this manual

recommends an alternative system. To maintain access to these federal funds, local jurisdictions can use both systems. The federal aid system encourages cities to designate more of these larger streets, and to concentrate modifications along these larger streets. Nevertheless, for the purposes of understanding design standards and guides, this is the existing system of street classification for federal funding.

AASHTO GREEN BOOK

The Green Book provides guidance for designing geometric alignment, street width, lane width, shoulder width, medians, and other street features. The Green Book applies only to streets and roads that are part of the National Highway System (NHS). These are Interstate Freeways, principal routes connecting to them, and roads important to strategic defense. Although the Green Book's application is limited to these streets, some cities apply its recommendations to all streets.



Further, the Green Book provides guidance that cities often unnecessarily treat as standards. The Green Book encourages flexibility in design within certain parameters, as evidenced by the AASHTO publication *A Guide to Achieving Flexibility in Highway Design*. For example, 10-foot lanes, which cities often shun out of concerns of deviating from standards, are well within AASHTO guidelines.

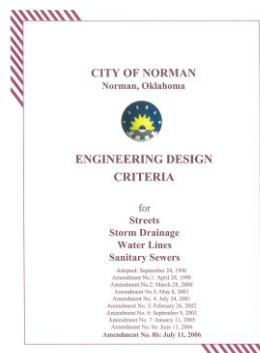
OKLAHOMA DEPARTMENT OF TRANSPORTATION ROADWAY DESIGN STANDARDS

The Oklahoma Department of Transportation *Roadway Design Standards* applies only to State Highways and bikeways within local jurisdictions. If cities deviate from the minimum widths and geometric criteria for bikeways spelled out they are advised to follow the design exception process, as applicable. These standards do not establish legal standards for designing local streets. However, like the Green Book, some cities apply these standards as guidance to all streets.



CITY OF NORMAN ENGINEERING DESIGN CRITERIA

The City of Norman's Engineering Design Criteria together with the City of Norman's Standard Specifications and Construction Drawings regulate both public improvements and private work which will either be dedicated to or accepted by the City. In addition, all work within the public right-of-way is governed by these regulations. They are intended to provide for coordinated development with adequate facilities to serve and protect the users.

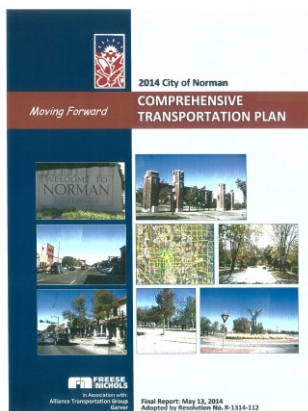


These documents are meant to provide minimum criteria and to apply rigidly to new developments which are not constrained by already existing improvements. Designers are encouraged to exceed these criteria whenever possible to provide better engineered facilities. Infill development in an urban area is often constrained when matching existing improvements. To the extent possible by the City Engineer, infill developments shall be completed in

accordance with the Engineering Design Criteria document. The City Engineer; however, may allow modification of these requirements when necessary to allow private and public construction which is compatible with surrounding in-place improvements.

These design criteria, standard specifications, and construction standards shall also be used in conjunction with the City's zoning regulations and subdivision ordinances for site development work on private property. The adoption of this Complete Streets Program Manual will offer additional flexibility in design not offered by the City's Engineering Design Criteria.

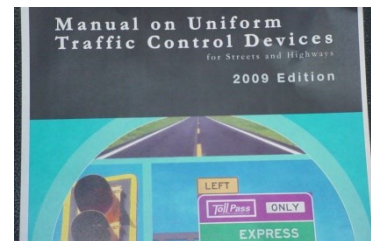
CITY OF NORMAN COMPREHENSIVE TRANSPORTATION PLAN



The City of Norman completed a multi-year process to develop a Comprehensive Transportation Plan (CTP) for the city. This process culminated with the adoption of the City's first CTP in May, 2014. The Norman CTP identifies future transportation needs for the area, goals and policies, and short-term and long-term capital investments for improvements to existing roads, construction of new roads, bicycle, pedestrian, and transit facilities. It provides a framework for a balanced transportation system that offers choices in how people travel, supported by a realistic approach to fund improvements. One of the Action Items from the CTP was the creation and adoption of a Complete Streets Program Manual.

MUTCD

The MUTCD provides standards and guidance for the application of all allowed traffic control devices including roadway markings, traffic signs, and signals. The Federal Highway Administration oversees application of the MUTCD. In addition to the State of Oklahoma, the City of Norman has adopted and follows the federal MUTCD.



The rules and requirements for the use of traffic control devices are different than for street design criteria. Local agencies have limited flexibility to deviate from the provisions of the MUTCD in the use of traffic control devices due to the relationship between the MUTCD and state law. The MUTCD does provide flexibility within its general provisions for items such as application of standard traffic control devices, use of custom signs for unique situations, traffic sign sizes, and sign placement specifics. In contrast, agencies do not generally have the flexibility to develop signs that are similar in purpose to signs within the MUTCD while using different colors, shapes, or legends. Agencies are also not authorized to establish traffic regulations that are not specifically allowed or are in conflict with state law. The provisions of the MUTCD and related state laws thus make it difficult to deploy new traffic control devices in Oklahoma. This can result in complications, especially in the areas of speed management, pedestrian crossings, and bikeway treatments.

The Federal Highway Administration has procedures that allow local agencies to experiment with traffic control devices that are not included in the current MUTCD. Such demonstrations are not difficult to obtain from the Federal Highway Administration for testing of new devices, especially as they relate to pedestrian and bicycle facilities, but the requesting agency must agree to conduct adequate before-and-after studies, submit frequent reports on the performance of the experimental device, and remove the device if early results are not promising.

The federal MUTCD is amended through experimentation. After one or more experiments have shown benefit, the new devices are sometimes adopted into the manuals. In Oklahoma, the Vehicle Code must be changed first if the Vehicle Code prevents use of the new device.

The federal MUTCD establishes warrants for the use of some traffic control devices. For example, STOP signs, traffic signals, and flashing beacons are expected to meet minimum thresholds before application. These thresholds include such criteria as number of vehicles, number of pedestrians or other uses, distance to other devices, crash history, and more. These warrants often prevent local engineers from applying devices that, in their opinion, may improve safety. For example, trail and/or pedestrian crossings of busy, high-speed, wide arterial streets may need signals for user safety, but they may not meet the warrants.

As with street design guidelines, cities may establish their own warrants or modify those suggested by the MUTCD to suit their context in order to use some traffic control devices. In special circumstances that deviate from their own warrants, cities need to document their reasons for the exception. For example, they may say the trail crossings or school crossings qualify for certain traffic control devices.

OKLAHOMA FIRE CODE

The City of Norman recognizes three codes and/or regulations related to adequate fire protection. The first is at the state level. The 2009 International Fire Code, Section 503 addresses fire apparatus access roads. The City of Norman also recognizes the NFPA 1-2009 Fire Code which addresses fire access in Chapter 18. Finally, fire access is covered in the City of Norman's Engineering Design Criteria and Standard Specifications. The City of Norman Ordinance states that where conflicts exist between these three sources, the provisions creating the higher degree of safety will be applied.

OKLAHOMA STATE VEHICLE CODE

The Oklahoma State Vehicle Code includes laws that must be followed in street design. The Oklahoma State Vehicle Code is where you'll find all the rules, laws, regulations, requirements, penalties, and anything else having to do with motor vehicles, drivers, roads, rules of the road, and anything else vehicular. It is what gets changed when new laws are added and when old laws are updated or deleted. This is commonly referred to as Title 47 and is embodied in the MUTCD. Changes to the State Vehicle Code may create a conflict with the MUTCD.

PURPOSE OF THE MANUAL

The safety and convenience of all users of the transportation system including, but not necessarily limited to, pedestrians, bicyclists, transit users, freight, and motor vehicle drivers shall be accommodated and balanced in all types of transportation and development projects and through all phases of a project so that even the most vulnerable—children, the elderly, and persons with disabilities—can travel safely within the public right of way. The purpose and need of this Complete Streets Program Manual is:

- To create complete, safe, and sustainable streets in the City of Norman,
- To provide simple, on-point design guidance that empowers city staff,
- and To provide a clear process and direction.

HOW THIS MANUAL WAS CREATED

This template from which this manual was created was a project of the Los Angeles County Department of Public Health. The department funded the production of this manual through a federal Communities Putting Prevention to Work grant to expand opportunities for people to bicycle and walk as an obesity prevention effort. The Luskin Center for Innovation at the University of California, Los Angeles, funded Chapter 10, “Streetscape Ecosystem,” to address environmental sustainability issues related to streets.



A team including many of the top street designers in the U.S. produced this manual. The team comprised experts from traffic engineering, transportation planning, land use planning, architecture, landscape architecture, public health, sociology, and other backgrounds. The team also included experts serving in leadership roles for the following national and local organizations:

- AARP Public Policy Institute
- American Society of Landscape Architects
- Association of Pedestrian and Bicycle Professionals
- California Department of Health Services
- California Strategic Growth Council
- City of Long Beach
- City of Los Angeles Planning Department
- Council for Watershed Health
- Congress for the New Urbanism
- Federal Highway Administration
- Green Los Angeles Coalition
- Institute of Transportation Engineers
- Los Angeles Chapter of the American Institute of Architects

- Los Angeles County Department of Public Health
- National Complete Streets Coalition
- Project for Public Spaces
- Safe Routes to School National Partnership
- Smart Growth America
- UCLA Luskin Center for Innovation
- US Access Board
- Walkable and Livable Communities Institute

The multidisciplinary nature of this team created concepts for streets that reflect viewpoints from various perspectives and lenses.

2. STREET NETWORKS AND CLASSIFICATIONS

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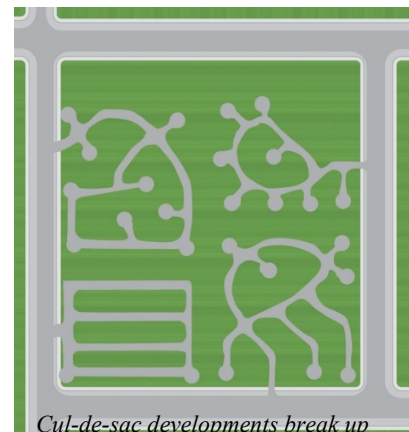
INTRODUCTION

The United States has a long and distinguished history of creating memorable and enduring cities, such as Savannah, Charleston, Washington, D.C., Boston, and San Francisco. These cities are memorable and enduring partly because of their street networks. Well-planned street networks help create sustainable cities that support the environmental, social, and economic needs of their residents.

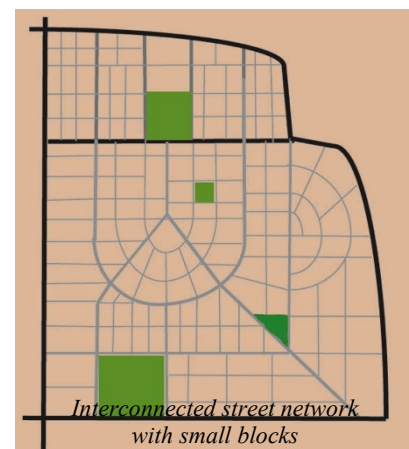
No matter how well our streets are planned, there are still approximately 30,000 Americans killed each year in traffic crashes on the nation's highways (National Highway Traffic Safety Administration, Data Resource Website, 2013 data). Locally from 2009 to 2013, fatal collisions in Norman have averaged 7.4 per year. Of these 7.4 annual fatal collisions, 3.4 are taking place on higher speed interstate, US highway, and state highway facilities and 4.0 are taking place on generally lower speed city streets. It is important to note that these numbers have been on the decline in recent years, but there remains work to be done. For the following reasons, a good street network is a powerful tool for reducing traffic crashes and fatalities while creating beautiful places:

- **Sustainable street networks improve traffic safety.** Hierarchical street patterns (arterial-collector-local) with cul-de-sac subdivisions depending on arterials do not perform as well as sustainable street networks and cause more traffic crashes. Hierarchical street networks divert traffic to high-speed arterials that have large intersections. Most crashes occur at intersections. The speed at which motor vehicles move on these arterial streets increases the likelihood and severity of crashes.

A 2011 study of 24 California cities found a 30 percent higher rate of severe injury and a 50 percent higher chance of dying in cities dominated by sparsely connected cul-de-sac compared with cities with dense, connected street networks (Marshall, W. and Garrick, N., "Does the Street Network Design Affect Traffic Safety?" *Accident Analysis and Prevention* 43[3]: 769-781). A 2009 study from Texas found that each additional mile of arterial roadway within a block group is associated with a 15 percent higher incidence of crashes (Dumbaugh, E.R. Rae, "Safe Urban Form: Revisiting the Relationship between Community Design and Traffic Safety," *Journal of the American Planning Association* 75[3]:309-329).



*Cul-de-sac developments break up connectivity and create longer trips
(Credit: Michele Weisbart)*



*Interconnected street network
with small blocks
(Credit: Marty Bruinsma)*

- **Sustainable street networks increase the number of people walking and bicycling and reduce vehicle miles traveled.** Connectivity enables people to take shorter routes. It also enables them to travel on quieter streets. These shorter routes on quiet streets are more conducive to bicycling and walking. The California study cited above found that places with a dense, connected street network had three to four times more people walking, bicycling, or using transit to get to work. This in turn led to a 50 percent reduction in vehicle miles traveled per capita in these cities (Marshall, W. and Garrick, N., “The Spatial Distribution of VMT Based upon Street Network Characteristics,” 90th Meeting of the Transportation Research Board, Washington, D.C., January 2011).
- **Sustainable street networks allow more effective emergency response.** Studies in Charlotte, North Carolina, found that when one connection was added between cul-de-sac subdivisions, the local fire station increased the number of addresses served by 17 percent and increased the number of households served by 12 percent. Moreover, the connection helped avoid future costs by slowing the growth of operating and capital costs; most of the cost to run a fire station is in salaries. Furthermore, Congress for the New Urbanism’s report on emergency response and street design found that emergency responders favor well-connected networks with a redundancy of routes to maximize access to emergencies. Emergency responders can get stuck in cul-de-sacs and need options when streets back up (“Effect on Connectivity on Fire Station Service Area and Capital Facilities,” 2009 presentation by the Charlotte, North Carolina DOT, charmeck.org/city/charlotte/citymanager/CommunicationstoCouncil/2009Communications/Documents/CNUPresentation).

These studies and others provide strong evidence that the benefits of a well-designed street network go beyond safety; they include environmental, social, and economic gains. Sustainable street networks shape land use markets and support compact development, in turn decreasing the costs of travel and providing utilities. Street networks like these are resilient over hundreds of years and accommodate changing technology, lifestyles, and travel patterns. Interconnected street networks can preserve habitat and important ecological areas by condensing development, reducing city edges, and reducing sprawl.

A sustainable and resilient street network fosters economic and social activity. It constrains traffic growth by limiting the number of lanes on each street while providing maximum travel options by collectively providing more lanes on more streets. By providing opportunities for all modes of travel, an ideal street network enhances social equity and provides an ideal setting for high quality design at all scales: building, neighborhood, and region. The resulting communities can be some of the most beautiful places with the highest values in the world.

ESSENTIAL PRINCIPLES OF SUSTAINABLE STREET NETWORKS

Sustainable street networks come in many shapes and forms, but have the following overarching principles in common:

- The sustainable street network both shapes and responds to the natural and built environment.
- The sustainable street network encourages trips by foot, bike, and transit because these are the most sustainable types of trips.
- The sustainable street network is built to walking dimensions.
- The sustainable street network works in harmony with other transportation networks, such as pedestrian, bicycle, transit, and private vehicle networks. Large parts of all of these networks are coincidental with the street network, but if any parts are separate from the street network, they must connect and interact with the network.
- The sustainable street network protects, respects, and enhances a city's natural features and ecological systems.
- The sustainable street network maximizes social and economic activity.

STREET CHARACTERISTICS AND CLASSIFICATIONS

A sustainable street network provides a pattern of multimodal streets that serves all community land uses and facilitates easy access to local, city, and regional destinations. The pattern, which may give priority to non-motorized modes, results in distribution of traffic that is consistent with the desired function of the street. One characteristic of this pattern is that it offers many route choices that connect origins with their destinations.

The street network works best when it provides a variety of street types. The variety is enforced by the pattern of the street network itself but also by the design of individual street segments. Natural and built features, including topography and important community destinations, should be taken into account to create unique designs.

In new subdivisions, integrating a network of shared use paths and earthen trails into the street network could be considered. Under this concept, every fourth or fifth “street” provides comfortable, quiet, access for non-motorized users along a linear parkway without motor vehicles. Where these intersect streets, they should be treated as intersections with appropriate treatments. This type of network would



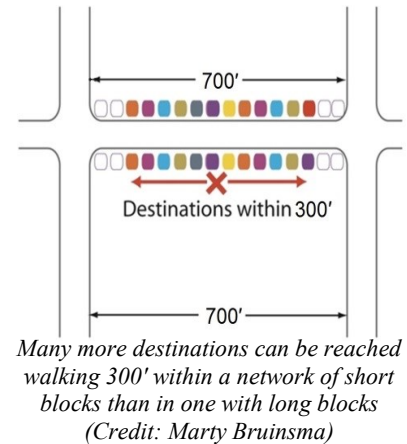
Concept to integrate non-motorized paths into new development (Credit: Michele Weisbart)

allow people to circulate in their new communities to schools, parks, stores, and offices while staying primarily on dedicated paths and trails. These networks can also link to paths and trails along waterways, utility corridors, rail rights-of-way, and other more common active transportation corridors. The adjacent diagram illustrates this concept.

The types of streets used in the network are described in the design standards below (see number 7). The types differ in terms of their network continuity, cross-section design, and adjoining land use. The individual streets themselves will change in character depending on their immediate land use context.

DESIGN STANDARDS

1. Establish a block size maximum of 700 linear feet between intersections
 - Ensure greater accessibility within the block through alleys, service courts, and other access ways
 - Where block size is exceeded, retrofit large blocks with new street, alleys, pedestrian and/or bicycle connections
 - For existing street networks, do not allow street closures that would result in larger blocks
2. Require multiple street connections between neighborhoods and districts across the whole region. This is achieved by having boulevards and avenues that extend beyond the local area. Adjacent neighborhoods must also be connected by multiple local streets.
3. Connect streets across urban freeways so that pedestrians and bicyclists have links to neighborhoods without having to use streets with freeway on and off ramps.
4. Maintain network quality by accepting growth and the concomitant expansion of the street network (including development, revitalization, intensification, or redevelopment) while avoiding increases in street width or in number of lanes.
5. Provide on-street curbside parking on most streets. Exceptions can be made for very narrow streets, streets with bus lanes, or where there is a better use of the space.
6. Establish maximum speeds of 25 to 35 mph
 - Use design features that support lower-speed environments
 - On local streets, the speed should be 25 mph
7. Maintain network function by discouraging
 - One-way streets
 - Turn prohibitions
 - Full or partial closures (except on bike boulevards, or areas taken over for other uses of public space)



- Removal of on-street parking (except when replaced by wider sidewalks, an enhanced streetscape, bus lanes, bike lanes, etc. rather than additional vehicle lanes)
 - Gated streets
 - Widening of individual streets
 - Conversion of city streets to limited access facilities
8. Classify major streets using the common street and context types presented in Table 2.1. However, some streets are unique and deserve a special category that lies outside the common street network types. Table 2.2 describes these special streets. Chapter 3, “Traveled Way Design,” contains guidance related to cross sections of these street typologies. New street types should be welcomed as well.

TYPES AND ROLES OF STREETS

Federal Highway Function and Classification system contains the conventional classification system that is commonly accepted to define the function and operational requirements for streets. These classifications are also used as the primary basis for geometric design criteria.

Traffic volume, trip characteristics, speed and level of service, and other factors in the functional classification system relate to the mobility of motor vehicles, not bicyclists or pedestrians, and do not consider the context or land use of the surrounding environment. This approach, while appropriate for high speed rural and some suburban roadways, does not provide designers with guidance on how to design for living streets or in a context-sensitive manner.

The street types described here provide mobility for all modes of transportation with a greater focus on the pedestrian. The functional classification system can be generally applied to the street types in this document. Designers should recognize the need for greater flexibility in applying design criteria, based more heavily on context and the need to create a safe environment for pedestrians, rather than strictly following the conventional application of functional classification in determining geometric criteria.

The terms for street types for living streets are described in the following sections. Many municipalities use the terms “avenue” and “street” in combination with the street name as a way to differentiate streets running north and south from those running east and west (e.g., 1st Street, 1st Avenue); these uses differ from the definitions used in this manual.

Arterial (Boulevard)

An arterial is a street designed for high vehicular capacity and moderate speed, traversing an urbanized area. Arterials serve as primary transit routes. Arterials should have bike lanes. They may be equipped with bus lanes or side access lanes buffering sidewalks and buildings. Many arterials also have landscaped medians.



Arterial Example: Norman, OK (Credit: David Riesland)

Collector (Avenue)

A collector is a street of moderate to high vehicular capacity and low to moderate speed acting as a short distance connector between urban centers and may be equipped with a landscaped median.



Collector Example: Norman, OK (Credit: David Riesland)

Local Street (Street)

A local street is a local, multi-movement facility suitable for all urbanized transect zones and all frontages and uses. A local street is urban in character, with raised curbs (except where curbless treatments are designed), drainage inlets, sidewalks, parallel parking, and trees in individual or continuous planters aligned in an alley. Character may vary in response to the commercial or residential uses lining the local street.



Local Street Example: Norman, OK (Credit: David Riesland)

Alley

An alley is a narrow street, often without sidewalks. Alleys connect streets and can provide access to the backs of buildings and garages.



Alley example: Norman, OK (Credit: David Riesland)

Table 2.1 provides a list of common street types. The special street typologies listed in Table 2.2 have particular functions within the street network.

Table 2.1 Common Street Types

Street Type	Description	Comment
Arterial* (Boulevard)	Traverses and connects districts and cities; primary a longer distance route for all vehicles including transit	Often has a planted median
Collector* (Avenue)	Traverses and connects districts, links local streets with arterials. For all vehicles including transit.	May or may not have a median
Local Street* (Streets)	Serves neighborhood, connects to adjoining neighborhoods; serves local function for vehicles and transit	
Alley	Link between local streets; allows access to garages	Narrow and without sidewalks
*May have segments with specialized functions and features such as a Main Street segment.		

Table 2.2 Special Street Types

Street Type	Description	Comment
Main Street	Slower vehicle speeds, favors pedestrians most, contains the highest level of streetscape features, typically dominated by retail and other commercial uses	Functions differently than other streets in that it is a destination
Transit Mall	The traveled way is for exclusive use by buses or trains, typically dominated by retail and other commercial uses	Excellent pedestrian access to and along the transit mall is critical. Bicycle access may be supported.
Bike Boulevard	A through street for bicycles, but short distance travel for motor vehicles	Usually a local street with low traffic volumes
Festival Street	Contains traffic calming, flush curbs, and streetscape features that allow for easy conversion to public uses such as farmers' markets and music events	
Shared Space	Slow, curbless street where pedestrians, motor vehicles, and bicyclists share space	May support café seating, play areas, and other uses



*16th Street Transit Mall: Denver, CO
(Credit: Ryan Snyder)*



*Shared space: Copenhagen, Denmark
(Credit: Ryan Snyder)*

3. TRAVELED WAY DESIGN

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INTRODUCTION



Wide Street
(Credit: David Riesland)

Streets and their geometric design have traditionally focused on the movement of motor vehicles, resulting in street environments that neglect other users. This emphasis can be seen in wide travel lanes, large corner radii, and turn lanes that severely impede the safety of pedestrians and the overall connectivity for non-automobile users. The geometric design of the traveled way and intersections has usually reflected the need to move traffic as quickly as possible. A paradigm shift needs to occur to reclaim the public right-of-way for pedestrians and bicyclists and create living streets.

Traveled way design in this chapter is defined as the part of the street right-of-way between the two faces of curbs and can include parking lanes, bicycle lanes, transit lanes, general use travel lanes, and medians. The design of the traveled way is critical to the design of the entire street right-of-way because it affects not just the users in the traveled way, but those using the entire right-of-way, including the areas adjacent to the street. As a note on terminology, “traveled way” in this document is more or less the equivalent of “roadway” in most conventional design manuals: the curb-to-curb portion of a curbed street.

ESSENTIAL PRINCIPLES OF TRAVELED WAY DESIGN

The following key principles should be kept in mind for a well-designed traveled way:

- **Design to accommodate all users.** Street design should accommodate *all* users of the street, including pedestrians, bicyclists, transit users, automobiles, and commercial vehicles. A well-designed traveled way provides appropriate space for all street users to coexist.
- **Design using the appropriate speed for the surrounding context.** The right design speed should respect the desired role and responsibility of the street, including the type and intensity of land use, urban form, the desired activities on the sidewalk, such as outdoor dining, and the overall safety and comfort of pedestrians and bicyclists. The speed of vehicles impacts all users of the street and the livability of the surrounding area. Lower speeds reduce crashes and injuries.
- **Design for safety.** The safety of all street users, especially the most vulnerable users (children, the elderly, and disabled) and modes (pedestrians and bicyclists) should be paramount in any design of the traveled way. The safety of streets can be dramatically improved through appropriate geometric design and operations.

Building on the momentum of complete streets that have been successfully implemented in different parts of the nation and around the world, there is a desire to retrofit existing streets and create new types of street environments that reflect the values and desires of all users. This chapter discusses different factors affecting traveled way design. Individual geometric design elements such as lane width and sight distance are examined in greater detail. The benefits and

constraints of each element are examined and the appropriate location and correct use of each element is defined to maximize the creation of living streets. Finally, a case study of La Jolla Boulevard in San Diego demonstrates the benefits of well-designed traveled ways.

FACTORS AFFECTING STREET DESIGN

USERS

Pedestrians

Walking is the most basic mode of transportation, yet pedestrians are often ignored in roadway design. Certain areas generate high pedestrian activity, such as downtowns, residential, commercial, and entertainment areas, and schools. Yet, even in areas of low pedestrian activity, such as along commercial strip-developed arterials, pedestrian needs and safety must be addressed, as drivers usually don't expect pedestrians, who are more vulnerable if a crash occurs. Much of this is due to speed. As speeds increase, drivers are less attentive to what is happening on the side of the road, reaction time is increased, and the pedestrian has a higher chance of dying or becoming severely injured in case of a crash.



*Senior citizens need more time to cross the street
(Credit: Ryan Snyder)*

Most pedestrian crashes occur when a person crosses the road, and the most common crash type is a conflict between a crossing pedestrian and a turning vehicle at an intersection.

However, designing for pedestrians should not focus primarily on avoiding crashes; the goal of roadway and intersection design should be to create an environment that is conducive to walking, where people can walk along and cross the road, where the roadside becomes a place where people want to be. The two most effective methods to achieve these goals are to minimize the footprint dedicated to motor vehicle traffic and to slow down the speed of moving traffic. This approach allows the designer to use many features that enhance the walking environment, such as trees, curb extensions, and street furniture, which in turn slows traffic. All urban streets should have sidewalks. All rural roads and shared-space streets should have sidewalks as practical.

See Chapter 5, "Universal Pedestrian Access," for specifics of sidewalk design and Chapter 6, "Pedestrian Crossings," for specifics of pedestrian crossings.

Bicyclists

All streets should be designed with the expectation that bicyclists will use them. This does not mean every street needs a dedicated bicycle facility, nor will every road accommodate all types

of bicyclists. Minimizing the footprint dedicated to motor vehicle traffic and reducing the speed of vehicular traffic does benefit bicyclists. Chapter 7, “Bikeway Design,” describes in greater detail the various types of bikeways and their application. Ideally, all multi-lane streets should have bike lanes. On multi-lane streets where bike lanes aren’t feasible because of space constraints, other bikeway treatments should be applied.

Public Transportation

Designing for transit vehicles on roadways takes into consideration many factors. Buses have operational characteristics that resemble trucks - they usually operate in mixed traffic, they stop and start often for passengers, and they must be accessible to people boarding the bus. The consequences for roadway design include lane width (in most cases buses can operate safely in travel lanes designed for passenger cars), intersection design (turning radius or width of channelization lane), signal timing (often adjusted to give transit an advantage—queue jumping), pedestrian access (crossing the street at bus stops), sidewalk design (making room for bus shelters in the furniture zone), and bus stop placement and design (farside/nearside at intersections, bus pullouts, or bulb outs).

Chapter 8, “Transit Accommodations,” describes in greater detail these and other design and operational considerations. Where express bus service or Bus Rapid Transit is provided, exclusive bus lanes are desirable. These have unique operating characteristics that are beyond the scope of this manual.

Design Vehicles

The design vehicle influences several geometric design features including lane width, corner radii, median nose design, and other intersection design details. Designing for a larger vehicle than necessary is undesirable, due to the potential negative impacts larger dimensions may have on pedestrian crossing distances and the speed of turning vehicles. On the other hand, designing for a vehicle that is too small can result in operational problems if larger vehicles frequently use the facility.

For design purposes, the WB-40 (wheel-base 40 feet) is appropriate unless larger vehicles are more common. On bus routes and truck routes, designing for the bus (CITY-BUS or similar) or large truck (either the WB-50 or WB-62FL design vehicle) may be appropriate, but only at intersections where these vehicles make turns. For example, for intersection geometry design features such as corner radii, different design vehicles should be used for each intersection or even each corner, rather than a “one-size-fits-all” approach, which results in larger radii than needed at most corners. The design vehicle should be accommodated without encroachment into opposing traffic lanes. It is generally acceptable to have encroachment onto multiple same-direction traffic lanes on the receiving roadway.

Furthermore, it may be inappropriate to design a facility by using a larger “control vehicle,” which uses the street infrequently, or infrequently makes turns at a specific location. An example of a control vehicle is a vehicle that makes no more than one delivery per day at a

business. Depending on the frequency, by under designing the control vehicle can be allowed to encroach on opposing traffic lanes or make multiple-point turns.

TRAFFIC VOLUME AND COMPOSITION

Traffic volume data collection is an integral part of transportation planning and decision making. Traffic volume data are collected for various periods of the day depending on the purpose for which the data is used. For most analyses it is necessary to collect peak period and daily traffic. Peak period traffic could be further divided into morning (a.m.), mid-day, and evening (p.m.) peak periods. Daily traffic data is also called average daily traffic (ADT). Other types of data collected are annual daily traffic, average annual daily traffic, average weekday traffic, hourly traffic (usually at intersections), and short-term counts as required. There are special types of traffic volume counts such as vehicle classification counts and average vehicle occupancy. The traffic volumes collected are also used for a variety of studies, including forecasting. Traffic volume on a segment of a road or at an intersection can be collected either manually or by using tubes.

The ADT volume is the most commonly collected traffic volume data. The ADT provides both the peak period traffic and the total daily traffic for analysis purposes. Typical ADT data for a central business district (CBD) will show an a.m., mid-day, and p.m. peak volume, which clearly indicates the typical usage of the CBD.

Vehicle classification counts are conducted on a daily basis to determine the types of vehicles using the roadway. The vehicle classification devices currently in use accurately record axle impulses, but do not provide consistent and accurate interpretation of axle impulses into classification of vehicles when vehicles (typically in urban areas) are traveling at speeds below 25 mph. The Federal Highway Administration (FHWA) has classified trucks into several categories based on the number of axles.

Turning movement volumes are collected at intersections to record the various turning movements. The collection of data on turning movements allows determining the level of service and making improvements to the intersection to reduce delay and idling for all vehicles. The data collected on traffic volumes and turning movements helps to determine the number of travel lanes needed.

DESIGN SPEED

The application of design speed for living streets is philosophically different than for conventional transportation practices. Traditionally, the approach for setting design speed is to use as high a design speed as practical. This has many negative effects. Speed kills places as well as people, and places efficiency over access. Because high design speeds reduce access to places on foot, they degrade the social and retail life of a street and devalue the adjacent land. Local economies thrive on attracting people.

In contrast to this approach, the goal of living streets is to establish design speeds that create a safer and more comfortable environment for motorists, pedestrians, and bicyclists. This

approach increases access to adjacent land, increasing its value, and therefore is appropriate for the surrounding context. For living streets, design speeds of 25 to 35 mph are desirable. Alleys and narrow roadways intended to function as shared spaces may have design speeds as low as 15 mph. Design speed does not determine nor predict the speed motorists will travel on a roadway segment; rather, design speed determines which design features are allowable (or mandated). Features associated with high-speed designs, such as large curb radii, straight and wide travel lanes, ample clear zones (no on-street parking or street trees), guardrails, etc., degrade the walking experience and make it difficult to design living streets. A slower design speed allows use of features to enhance the walking environment, such as small curb radii, narrower sections, trees, on-street parking, curb extensions, and street furniture, which in turn slows traffic.

Movement Types

The following movement types describe the expected driver experience on a given street and the design speed for pedestrian safety and mobility established for each of these movement types. They are also used to establish the components and criteria for design of living streets.



*High auto level of service with low multi-modal level of service
(Credit: Dan Burden)*

- **Yield:** Drivers must proceed slowly with extreme care and must yield in order to pass a parked car or approaching vehicle. This is equivalent to traffic calming. With lower design speeds, this type should accommodate bicycling through the use of shared lanes.

- **Slow:** Drivers can proceed carefully with an occasional stop to allow a pedestrian to cross or another car to park. Drivers should feel uncomfortable exceeding design speed due to the presence of parked cars, a feeling of enclosure, tight turn radii, and other design elements. With a design speed of 25 to 30 mph, this type should accommodate bicycling through the use of shared lanes.

- **Low:** Drivers can expect to travel generally without delay at the design speed; street design supports safe pedestrian movement at the higher design speed. This movement type is appropriate for streets designed to traverse longer distances or that connect to higher intensity locations. With a design speed of 30 to 35 mph, this type can accommodate bicycling with the use of bike lanes.

MULTI-MODAL LEVEL OF SERVICE

Municipalities use qualitative assessments to describe the perceived service a street provides to the people using the facility. The quality of service has conventionally been obtained using Level of Service (LOS) measurements. LOS assesses delay for motorists along a roadway section or at a signalized intersection. The LOS is defined using letters A to F,



*High multi-modal level of service
(Credit: Ryan Snyder)*

where LOS F denotes the greatest delay and LOS A no delay. The LOS is used to develop solutions to improve the existing system to achieve the desired LOS. This convention considers quality of service for only automobiles and other vehicles (commercial) using the roadway system. The Highway Capacity Manual (HCM) provides details of the LOS computations for roadways and intersections.

Since traveled ways are used by different modes, the multimodal level of service (MMLOS) was developed under National Cooperative Highway Research Program (NCHRP) project 3-70. The MMLOS was developed for urban streets and it is currently designed for analysis of steady state conditions during a specified analysis period. MMLOS applies to urban streets with all modes of travel (cars, pedestrians, transit, and bicycles) and assesses the impacts of facility design and operation on all users except for commercial vehicles. The MMLOS analysis provides a tool to predict travel perceptions of quality of service.

The MMLOS for the four modal usages is output as numerical ratings, which are converted into the traditional A to F letter grade system. Table 3.1 indicates the MMLOS letter grade equivalents of the numerical values obtained.

Table 3.1 MMLOS Letter Grade Equivalents

MMLOS Modal Output	MMLOS Letter Grade
Model ≤ 2.0	A
$2.0 < \text{Model} \leq 2.75$	B
$2.75 < \text{Model} \leq 3.50$	C
$3.50 < \text{Model} \leq 4.25$	D
$4.25 < \text{Model} \leq 5.00$	E
Model > 5.0	F

Source: NCHRP-Web Only Document 128: Multimodal level of service analysis for urban streets: User Guide, 2009.

Notes:

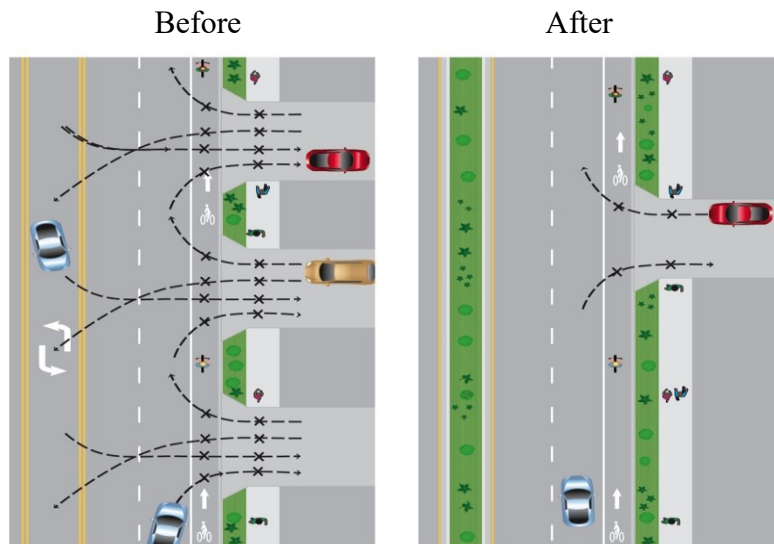
1. If any directional segment hourly volume/capacity ratio (v/c) exceeds 1.0 for any mode, that direction of street is considered to be operating at LOS F for that mode of travel for its entire length (regardless of the computed LOS).
2. If the movement of any mode is legally prohibited for a given direction of travel on the street, then the LOS for that mode is LOS "F" for that direction.

For conducting MMLOS it is necessary to select a roadway segment that has signalized intersections, transit usage, bicycle riders, and pedestrians. The segment could have 5 to 6 signals in the selected section. The data required for conducting MMLOS includes street geometrics, such as number of through lanes, width of lanes, median width, bike lane, shoulder width, parking lane width, sidewalk width, right turn lanes, transit stops, and signalized and un-signalized intersections. The methodology provides some basic default values for use, which can be found in the reference provided at the end of this chapter.

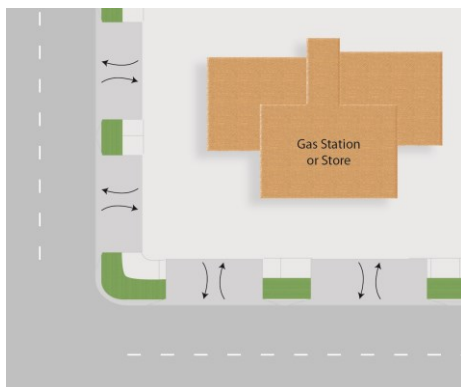
By conducting an MMLOS analysis of existing roadway segments, the agency will be able to identify the deficiency in the system for all the modes. Using the results to change the analyzed street segment will improve the system for all users. The result should lead to very different decisions than would be made under the traditional LOS assessment. Using LOS as the measurement, municipalities typically remedy low LOS by widening streets, flaring

intersections, and other measures designed to improve the flow of autos. In contrast, applying MMLOS can lead to improvements for pedestrians, bicyclists, and transit users.

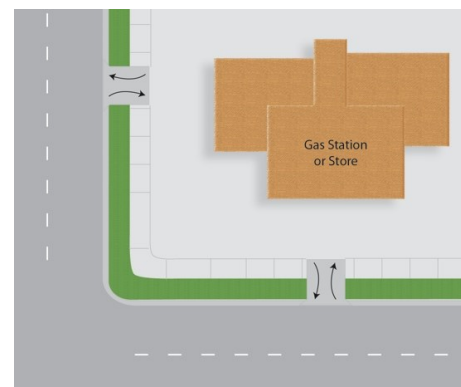
ACCESS MANAGEMENT



A major challenge in street design is balancing the number of access points to a street. As discussed in Chapter 2, “Street Networks and Classifications,” there are many benefits of well-connected street networks. On the other hand, most conflicts between users occur at intersections and driveways. The presence of many driveways in addition to the necessary intersections creates many conflicts between vehicles entering or leaving a street and bicyclists and pedestrians riding or walking along the street. When possible, new driveways should be minimized and old driveways should be eliminated or consolidated, and raised medians should be placed to limit left turns into and out of driveways.



*Adding medians and consolidating driveways to manage access
(Credit: Michele Weisbart)*



*Corner with many wide driveways reconstructed corner with fewer, narrower driveways
(Credit: Michele Weisbart)*

Access management by limiting driveways and providing raised medians has many benefits:

- The number of conflict points is reduced, especially by replacing center-turn lanes with raised medians since left turns by motorists account for a high number of crashes with bicyclists and pedestrians.
- Pedestrian crossing opportunities are enhanced with a raised median.
- Universal access for pedestrians is easier, since the sidewalk is less frequently interrupted by driveway slopes.
- Fewer driveways result in more space available for higher and better uses.
- Improved traffic flow may reduce the need for road widening, allowing part of the right-of-way to be recaptured for other users.

Possible Negatives of Access Management

The following possible negative effects of management should be considered and addressed:

- Streamlining a street may increase motor vehicle speeds and volumes, which can be detrimental to other users.
- Reduced access to businesses may require out-of-direction travel for all users, including walkers and bicyclists.
- Concrete barriers and overly-landscaped medians act as barriers to pedestrian crossings. Medians should be designed with no more than normal curb height and with landscaping that allows pedestrians to see to the other side.
- Adjacent land uses can experience decreased access. This can impact businesses as well as residents. Careful planning of access management considers this.

CROSS SECTIONAL ELEMENTS

Living street design treats streets as part of the public realm. The street portion of the public realm is shaped by the features and cross section elements used in creating the street. Attention to what features are included, where they are placed, and how the cross section elements are assembled is necessary.

ON-STREET PARKING

On street parking can be important in the urban environment for the success of the retail businesses that line the street and to provide a buffer for pedestrians and help calm traffic speeds. On-street parking occupies about half the surface area per car compared to off-street, which requires driveways and aisles for access and maneuvering. However, cities should manage demand for on-street parking by charging market-rate prices. Free or underpriced parking encourages people to drive instead of taking transit, biking, or walking. Parking expert Donald Shoup recommends setting variable



parking prices to target a 15 percent vacancy rate for curb parking. In addition to encouraging people to curtail driving, it also creates turnover that benefits retailers by making convenient parking available for short shopping trips.

Where angle parking is proposed for on-street parking, designers should consider the use of reverse-in angle (or front out) parking in lieu of front-in angled parking. Motorists pulling out of reverse-in angled parking can better see the active street they are entering. This is especially important to bicyclists. Moreover, people exiting cars do so on the curb side and aren't likely to step into an active travel lane.

Another tool for on-street parking is the park assist lane. Often when on-street parking is provided on busy roads, drivers find it difficult to enter and leave their parked vehicle. Where space is available, consideration should be given to adding a park assist lane between the parking lane and travel way to provide 3 feet of space so car doors can be opened and vehicles can enter or depart with a higher degree of safety and less delay. Bike lanes can serve this function as well. Parking assist lanes also narrow the feel of the travel lane and slow traffic. Table 3.2 below details recommended parking lane widths for slow and low movement types.



*Parking assist lane
(Credit: Michael Wallwork)*

Table 3.2 Parking Lane Widths

Movement Type	Design Speed	Parking Lane Width
Slow	25 mph	Angle: 16.5'(60°); 15'(45°)
Slow	25 mph	Parallel: 7 feet
Low	30-35 mph	Parallel: 7-8 feet

BICYCLE FACILITIES

Bicycle facilities within the traveled way may include bicycle lanes, bicycle boulevards, other types of shared roadways (with or without shared lane markings), and cycle tracks. See Chapter 7, “Bikeway Design,” for design recommendations for these facilities.

TRANSIT FACILITIES

Transit accommodations within the traveled way may include dedicated transit lanes, bus bulbs, bus pullouts, and other features. See Chapter 8, “Transit Accommodations,” for design recommendations for these features.

TRAVEL LANES

Travel lane widths should be provided based on the context and desired speed for the area that the street is located. Table 3.3 shows lane widths and the associated speeds that are appropriate. In low speed urban environments, lane widths are typically measured to the curb face instead of the edge of the gutter pan. Consequently, when curb sections with gutter pans are used, the vehicle, bike, and parking lane all include the width of the gutter pan.

In order for drivers to understand how fast they should drive, lane widths have to create some level of driver discomfort when driving too fast. The presence of on-street parking is important in achieving the speeds shown in Table 3.3. When designated bike lanes or multi-lane configurations are used, there is more room for large vehicles, such as buses, to operate in, but car drivers will feel more comfortable driving faster than is desired.



*Wide Two-Lane Street
(Credit: Angelo Lombardo)*



*Narrow Two-Lane Street
(Credit: David Riesland)*

Table 3.3 Travel Lane Widths and Associated Design Speeds

Movement Type	Design Speed	Travel Lane Width
Yield*	25 mph	N/A
Slow	25-30 mph	9**-10 feet
Low	30-35 mph	10-11*** feet

- *Yield streets are typically residential two-way streets with parking on one or both sides. When the street is parked on both sides, the remaining space between parked vehicles (12 feet minimum) is adequate for one vehicle to pass through. Minimum width for a yield street with parking on both sides should be 26 feet curb face to curb face. Minimum width for a yield street with parking on one side should be 20 feet curb face to curb face, which allows for two 10-foot lanes when the street is not parked.
- **9' requires a design exception.
- ***Generally, 10-foot lanes are preferred. Where heavy bus or truck traffic exists, 11-foot lanes may be considered.

Alleys can be designed as one-way or two-way. Right-of-way width should be a minimum of 20 feet clear with no permanent structures located within the right-of-way that would interfere with vehicle access to garages or parking spaces, access for trash collection, and other operational needs. Pavement width should be a minimum of 12 feet. Coordination with local municipalities on operational requirements is essential to ensure that trash collection and fire protection services can be completed.

Turn Lanes

The need for turn lanes for vehicle mobility should be balanced with the need to manage vehicle speeds and the potential impact on the border width such as sidewalk width. Turn lanes tend to allow higher speeds to occur through intersections, since turning vehicles can move over to the turn lane, allowing the through vehicles to maintain their speed.

Left-turn lanes are considered to be acceptable in an urban environment since there are negative impacts to roadway capacity when left turns block the through movement of vehicles. Sometimes just a left-turn pocket is sufficient, just long enough for one or two cars to wait out of traffic. The installation of a left-turn lane can be beneficial when used to perform a road diet such as reducing a four lane section to three lanes with the center lane providing for turning movements.

In urban places, normally no more than one left-turn lane should be provided. While right turns from through lanes may delay through movements, they also create a reduction in speed due to the slowing of turning vehicles. The installation of right-turn lanes increases the crossing distance for pedestrians and the speed of vehicles; therefore, exclusive right turn lanes should rarely be used except at "T" intersections. When used, they should be mitigated with raised channelization islands. See Chapter 4, "Intersection Design," for more details.

MEDIANS



Well-designed street medians bring multiple benefits (Credit: Dan Burden)

Medians used on urban streets provide access management by limiting left turn movements into and out of abutting development to select locations where a separate left turn lane or pocket can be provided. The reduced number of conflicts and conflict points decrease vehicle crashes, provides pedestrians with a refuge as they cross the road, and provides space for landscaping, lighting, and utilities. These medians are usually raised and curbed. Landscaped medians enhance the street or help to create a gateway entrance into a community.

Medians can be used to create tree canopies over travel lanes, contributing to a sense of enclosure. As shown in Table 3.4, medians vary in width. Recommended widths depend on available right-of-way and function. Because medians require a wider right-of-way, the designer must weigh the benefits of a median with the issues of pedestrian crossing: distance, speed, context, and available roadside width.

Table 3.4 Median Types and Widths

Median Type	Minimum Width	Recommended Width
Median for access control	4 feet	6 feet
Median for pedestrian refuge	6 feet	8 feet
Median for trees and lighting	6 feet [1]	10 feet [2]
Median for single left-turn lane	10 feet [3]	10 feet [2]
Median for single left-turn lane and pedestrian refuge	16 feet [4]	16 feet

Table Notes

[1] Six feet measured curb face to curb face is generally considered the minimum width for proper growth of small caliper trees (less than 4 inches).

[2] Wider medians provide room for larger caliper trees and more extensive landscaping.

[3] A 10-foot lane provides for a turn lane without a concrete traffic separator.

[4] Includes a 10-foot turn lane and a 6-foot pedestrian refuge.

Sample Cross Sections

The City of Norman Comprehensive Transportation Plan adopted by Council Resolution R-1314-112 on May 13, 2014, contains a number of cross-sectional options for the various roadway functional classifications. These cross sections are contained in Appendix D: Design Typical Sections.

OTHER GEOMETRIC DESIGN ELEMENTS

VERTICAL ALIGNMENT

The American Association of State Highway and Transportation Officials (AASHTO) *Geometric Design of Highways and Streets* manual (AASHTO Green Book) provides acceptable values for designing vertical curves for living streets. The values used in design of vertical curve design should be selected based on the design speed appropriate for the context of the street. Using higher values can contribute to increased vehicle speeds and may require increased modification to the natural terrain, increasing negative impacts to the natural environment.

HORIZONTAL ALIGNMENT

The AASHTO Green Book provides appropriate values for designing horizontal curves for living streets. The values used in horizontal curve design should be selected based on the design speed appropriate for the context of the street. Using higher values can contribute to increased vehicle speeds and also impacts the character of the street. Larger horizontal curves also create a more “suburban” or “rural” highway feel.

SIGHT DISTANCE

Stopping Sight Distance

The AASHTO Green Book provides appropriate values for designing stopping sight distance for living streets. Appropriate design speed selection is critical to avoid overly negative impacts such as unnecessarily limiting on-street parking and tree planting.

Intersection Sight Distance

Clear sight distance is needed at intersections and driveway connections for two reasons. The driver stopped on the cross street or driveway must have sufficient sight distance along the main street to select a gap between approaching vehicles to safely enter and depart the intersection area. The driver on the main street must have a view of the cross street from a sufficient distance to allow him to safely react when a vehicle from the cross street enters the main street. The required sight distance for intersections is based on the geometric design of the street, vehicle operating characteristics, driver behavior, and the design speed of the street. These distances are based on current American Association of State Highway and Transportation (AASHTO) criteria.

Clear-sight windows to provide drivers of vehicles on both the main street and the cross street sufficient clear view of one another must be available to afford both drivers with the opportunity to be able to safely react to a potential conflict. The spacing and size of tree trunks within the clear sight distance must be controlled. This is necessary to provide adequate clear-sight window width between trees and to limit the amount of sight blockage by the tree trunk. These controls are based on the design of the street and its design speed. Standards for tree trunk size

and spacing between trees and ground cover, within the intersection sight distance, are shown in Table 3.5.

Table 3.5 Tree Spacing Table

Description	Speed (mph)											
	25		30		35		40		45		50	
Diameter	(inches)											
Within Limits of Sight Window	A	B	A	B	A	B	A	B	A	B	A	B
	(feet)											
Min. Spacing (c. to c. of Trunk)	17	74	22	91	27	108	33	126	40	146	45	165

Table Notes

[1] “A” represents a trunk diameter greater than 4 inches but not greater than 11 inches.

[2] “B” represents a trunk diameter greater than 11 inches but not greater than 18 inches.

[3] Sizes and spacing are based on the following conditions:

- a. A single line of trees in the median parallel to but not necessarily collinear with the centerline.
- b. Trees with diameters less than or equal to 11 inches intermixed with trees with diameters greater than 11 inches but not greater than 18 inches are to be spaced as if all trees are greater than 11 inches but not greater than 18 inches.

HORIZONTAL CLEARANCE/CLEAR ZONE

Horizontal clearance is the lateral distance from a specified point on the roadway, such as the edge of the travel lane or face of the curb, to a roadside feature or object. The clear zone is the relatively flat unobstructed area that is to be provided for safe use by errant vehicles.

In urban areas, horizontal clearance based on clear zone requirements for rural and suburban highways is not practical because urban areas are characterized by more bicyclists and pedestrians, lower speeds, more dense abutting development, closer spaced intersections and accesses to property, higher traffic volumes, and restricted right-of-way. Therefore, streets with curbs and gutters in urban areas do not have sufficiently wide roadsides to provide clear zones. Consequently, while there are specific horizontal clearance requirements for these streets, they are based on clearances for normal operation and not based on maintaining a clear roadside for errant vehicles. The minimum horizontal clearance is 1.5 feet measured from the face of the curb. This is primarily intended for sign posts and poles, so they aren’t hit by large vehicles with overhangs maneuvering close to the curb.

TRAVELED WAY LIGHTING

Pedestrians are disproportionately hit when visibility is poor: at dusk, night, and dawn. Many crossings are not well lit. Providing illumination or improving existing lighting increases nighttime safety at intersections and midblock crossings, as motorists can better see pedestrians. Pedestrian scale lighting along sidewalks provides greater security, especially for people walking alone at night.

Transit stops require both kinds of lighting: strong illumination of the traveled way for safer street crossing, and pedestrian scale illumination at the stop or shelter for security.

FHWA-HRT-08-053, *Informational Report on Lighting Design for Midblock Crosswalks*, (April 2008) is a very good resource. It also contains very useful information about lighting design for pedestrians at intersections.

If bus stops are present between roadway sections, it is necessary to illuminate the roadway and the bus stop. The lighting at the bus stop is essential to provide safety for transit users. Bus stops have high pedestrian activity; therefore, it is necessary to provide adequate lighting at these facilities.

MODEL PROJECT

LA JOLLA

La Jolla Boulevard in the Bird Rock neighborhood of San Diego is an example of the conversion of a five-lane road. Due to parents' complaints that they had to drive their children across the road, a community charrette was organized in 2002. As a result, a new concept was developed that included a median, one 11-foot travel lane in each direction, park assist lanes next to the parallel parking lane on the east side, and a wider park assist lane next to the angled parking on the west side of the street. The five intersections that were controlled by two or four-way STOP control and signals were converted to single lane roundabouts.

The project was opened in stages and completed in August 2008. Although the traffic volumes have decreased because of the recession from 22,000 vehicles per day to 17,000 vehicles per day, the pedestrian and bicycle volumes have increased enormously (City of San Diego traffic counts and traffic webcam, 2010).



*La Jolla Boulevard intersection before and after roundabout: San Diego, CA
(Credit: Michael Wallwork)*

4. INTERSECTION DESIGN

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INTRODUCTION



*Lively intersection
(Credit: David Riesland)*

Most conflicts between roadway users occur at intersections, where travelers cross each other's path. Good intersection design indicates to those approaching the intersection what they must do and who has to yield. Exceptions to this include places where speeds are low or where a shared space design causes users to approach intersections with caution. Conflicts for pedestrians and bicyclists, due to their greater vulnerability, lesser size, and reduced visibility to other users, are exacerbated.

This chapter describes design considerations in intersection geometry and intersection signalization, as well as roundabouts and other features to improve safety, accessibility, and mobility for all users. The benefits and constraints of each feature are examined and the appropriate use and design of each feature are described.

ESSENTIAL PRINCIPLES OF INTERSECTION DESIGN

The following principles apply to all users of intersections:

- Good intersection designs are compact.
- Unusual conflicts should be avoided.
- Simple right-angle intersections are best for all users since many intersection problems are worsened at skewed and multi-legged intersections.
- Free-flowing movements should be avoided.
- Access management practices should be used to remove additional vehicular conflict points near the intersection.
- Signal timing should consider the safety and convenience of all users and should not hinder bicycle or foot traffic with overly long waits or insufficient crossing times.

INTERSECTION GEOMETRY

Intersection geometry is a critical element of intersection design, regardless of the type of traffic control used. Geometry sets the basis for how all users traverse intersections and interact with each other. The principles of intersection geometry apply to both street intersections and freeway on- and off-ramps.

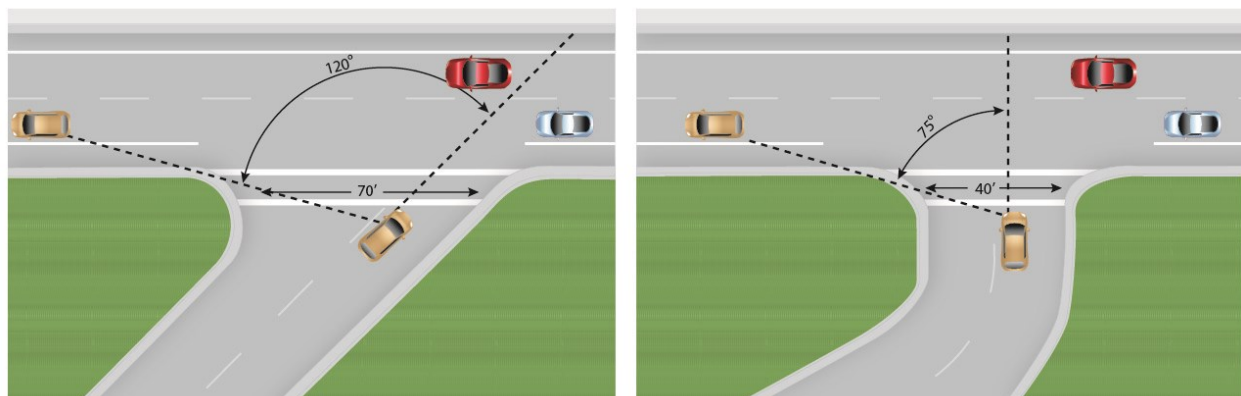
INTERSECTION SKEW

Skewed intersections are generally undesirable and introduce the following complications for all users:

- The travel distance across the intersection is greater, which increases exposure to conflicts and lengthens signal phases for pedestrians and vehicles.
- Skews require users to crane their necks to see other approaching users, making it less likely that some users will be seen.
- Obtuse angles encourage speeding.

To alleviate the problems with skewed intersections, several options are available:

- Every reasonable effort should be made to design or redesign the intersection closer to a right angle. Some right-of-way may have to be purchased, but this can be offset by the larger area no longer needed for the intersection, which can be sold back to adjoining property owners or repurposed for a pocket park, rain garden, greenery, etc.
- Pedestrian refuges should be provided for if the crossing distance exceeds approximately 40 feet.
- General use travel lanes and bike lanes may be striped with dashes to guide bicyclists and motorists through a long undefined area.



Realigning the skewed intersection in the graphic on the left to the right-angle connection in the graphic on the right results in less exposure distance and better visibility for all users.

(Credit: Michele Weisbart)

Multi-leg intersections (more than two approaching roadways) are generally undesirable and introduce the following complications for all users:

- Multiple conflict points are added as users arrive from several directions.
- Users may have difficulty assessing all approaches to identify all possible conflicts.
- At least one leg will be skewed.
- Users must cross more lanes of traffic and the total travel distance across the intersection is increased.

To alleviate the problems with multi-leg intersections, several options are available:

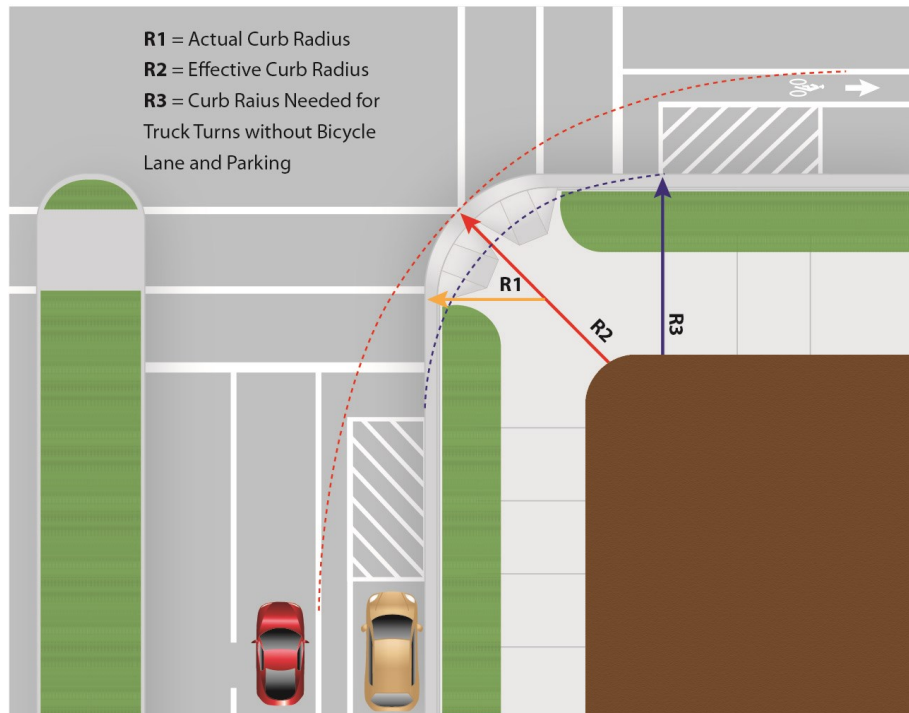
- Every reasonable effort should be made to design the intersection so there are no more than four legs. This is accomplished by removing one or more legs from the major intersection and creating a minor intersection further up or downstream.
- As an alternative, one or more of the approach roads can be closed to motor vehicle traffic, while still allowing access for pedestrians and bicyclists.
- Roundabouts should be considered.
- Pedestrian refuges should be created if the crossing distance exceeds approximately 40 feet.
- General use travel lanes and bike lanes may be striped with dashes to guide bicyclists and motorists through a long undefined area.

CORNER RADII

This intersection geometry feature has a significant impact on the comfort and safety of non-motorized users. Small corner radii provide the following benefits:

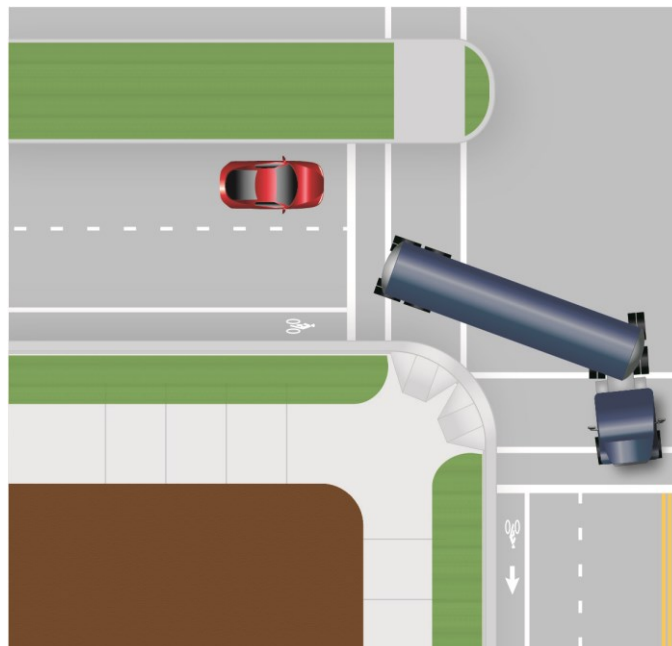
- Smaller, more pedestrian-scale intersections resulting in shorter crossing distances
- Slower vehicular turning speeds
- Reduced pedestrian crossing distance and crossing time
- Better geometry for installing perpendicular ramps for both crosswalks at each corner
- Simpler, more appropriate crosswalk placement, in line with the approaching sidewalks

When designing corner radii for complete streets, designers should make every attempt to minimize the corner radius. However, the standard corner radius is 30 feet. Larger design vehicles should be used only where they are known to regularly make turns at the intersection, and corner radii should be designed based on the larger design vehicle traveling at crawl speed. In addition, designers should consider the effect that bicycle lanes and on-street parking have on the effective radius, increasing the ease with which large vehicles can turn.



*The effective corner radius controls turning speeds and the ability of large vehicles to turn.
 (Credit: Michele Weisbart)*

In some situations encroachment by large vehicles may be acceptable onto multiple receiving lanes. As described in Chapter 3, “Traveled Way Design,” larger, infrequent vehicles (the “control vehicle”) can be allowed to encroach on multiple departure lanes and partway into opposing traffic lanes. In the example below, corner radii can be kept smaller by allowing trucks and buses to turn into multiple receiving lanes.

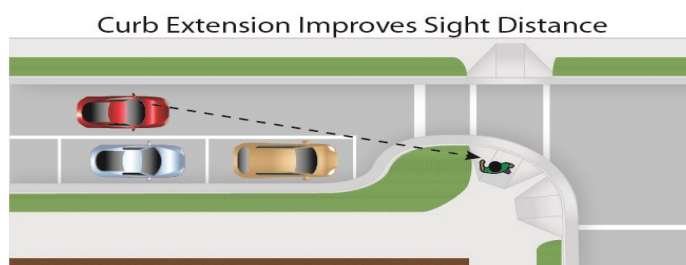
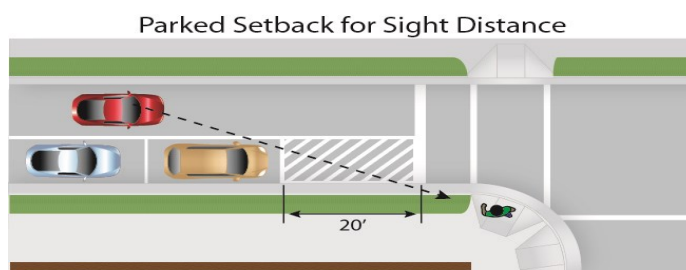
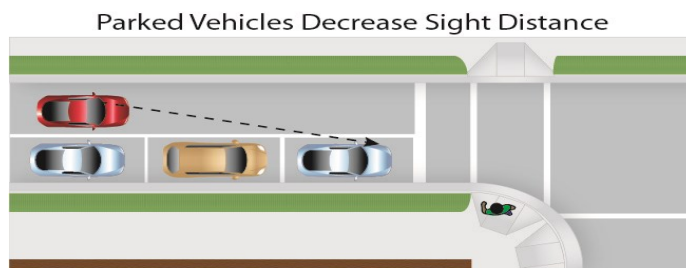


CURB EXTENSIONS

Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at crosswalks. Curb extensions should be the same width as the parking lane. The appropriate corner radius should be applied based on the guidance in the section above. Due to reduced road width, the corner radius on a curb extension may need to be larger than if curb extensions were not installed.

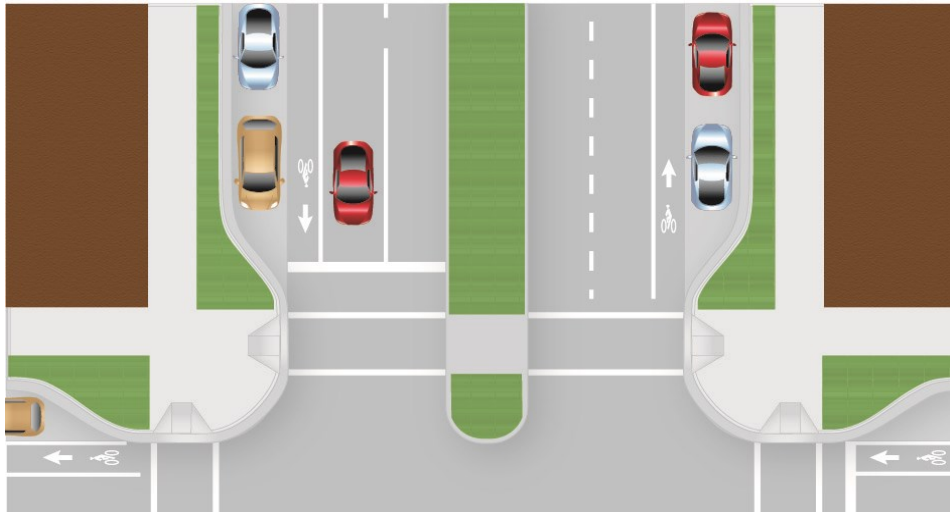
Curb extensions offer many benefits related to livability:

- Reduced pedestrian crossing distance resulting in less exposure to vehicles and shorter pedestrian clearance intervals at signals
- Improved visibility between pedestrians and motorists
- A narrowed roadway, which has a potential traffic calming effect
- Additional room for street furniture, landscaping, and curb ramps
- Slower turning vehicles
- Additional on-street parking potential due to improved sight lines at intersections. Since curb extensions allow pedestrians to walk out toward the edge of the parking lane without entering the roadway, pedestrians can better see vehicles and motorists can better see pedestrians.
- Management of storm water runoff



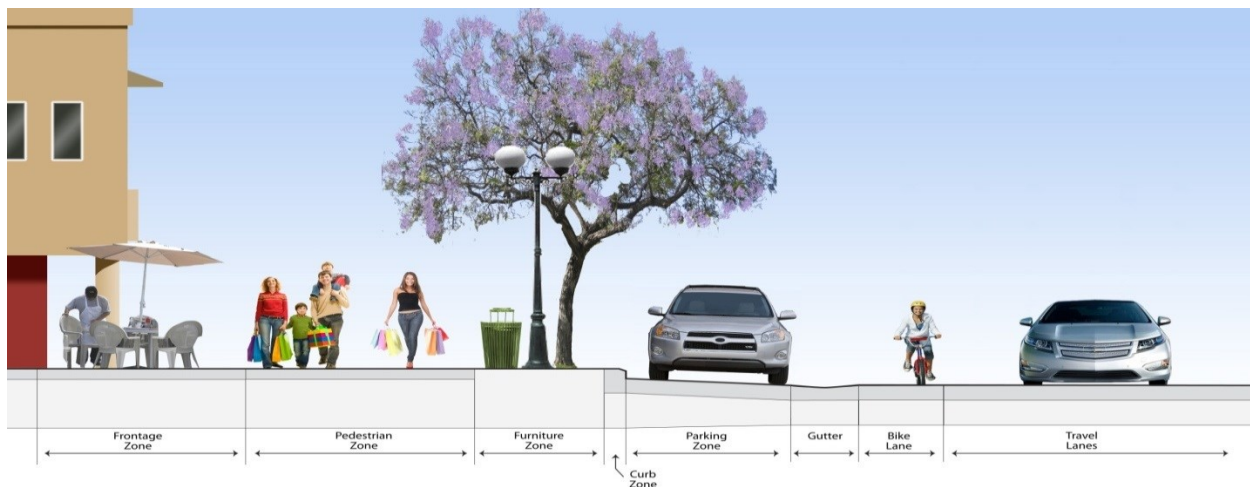
Curb extensions improve sight distance between pedestrians and motorists, possibly allowing additional on-street parking.
(Credit: Michele Weisbart)

To fully achieve livability goals, the curb extension and parking area can be integrated into the furniture zone portion of the sidewalk corridor. This technique involves using similar surface materials for the curb extension, parking area, and the sidewalk as shown in the figure below. Instead of the curb extensions appearing to jut out into the street, the parking appears as “parking pockets” in the furniture zone.



Integrating curb extensions and on-street parking into the sidewalk corridor enhances pedestrian safety and the walking experience. (Credit: Michele Weisbart)

To reinforce this design where street grades permit, the gutter line and drainage grates should be placed between the travel lane and the parking lane/curb extensions. This is called a “valley gutter” and creates a stronger visual cue separating the parking lane from the bicycle lane or travel lane. It can sometimes allow existing drainage infrastructure to be left in place.



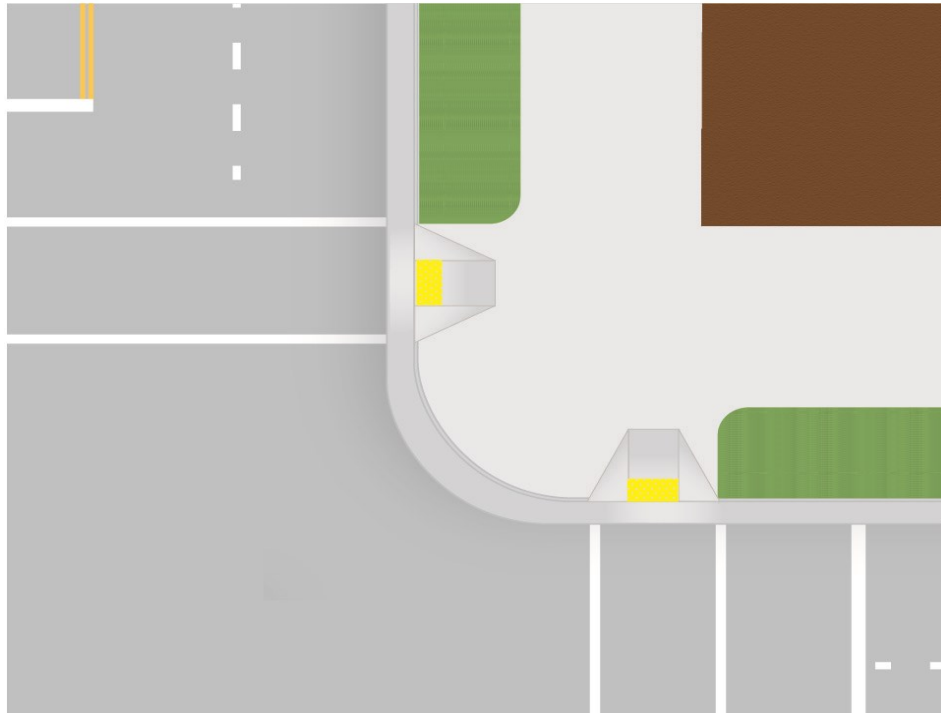
An example of integrating curb extensions and parking into the sidewalk corridor by placing a valley gutter between the parking and the traveled way. (Credit: Michele Weisbart)

CROSSWALK AND RAMP PLACEMENT

Crosswalks and ramps at intersections should be placed so they provide convenience and safety for pedestrians. The following recommended practices will help achieve these goals:

- Allow crossings on all legs of an intersection, unless there are no pedestrian accessible destinations on one or more of the corners. Closing a crosswalk usually results in a pedestrian either walking around several legs of the intersection, exposing them to more conflicts, or crossing at the closed location, with no clear path or signal indication as to when to cross.
- Provide marked crosswalks at signalized intersections.
- Place crosswalks as close as possible to the desire line of pedestrians, which is generally in line with the approaching sidewalks.
- Provide as short as possible a crossing distance to reduce the time that pedestrians are exposed to motor vehicles; this is usually as close as possible to right angles across the roadway, except for skewed intersections.
- Ensure that there are adequate sight lines between pedestrians and motorists. This typically means that the crosswalks should not be placed too far back from the intersection.
- When a raised median is present, extend the nose of the median past the crosswalk with a cut-through for pedestrians.
- Provide one ramp per crosswalk (two per corner for standard intersections with no closed crosswalks). Ramps must be entirely contained within a crosswalk (the crosswalk can be flared to capture a ramp that cannot be easily relocated). Align the ramp run with the crosswalk when possible, as ramps that are angled away from the crosswalk may lead some users into the intersection.
- Aesthetic textured pavement materials (e.g., brick and pavers) can only be used in the frontage and furniture zones.

At intersections where roads are skewed or where larger radii are necessary for trucks, it can be difficult to determine the best location for crosswalks and sidewalk ramps. In these situations, it is important to balance the recommended practices above. Tighter curb radii make implementing these recommendations easier.



One curb ramp per crosswalk should be provided at corners. Ramps should align with sidewalks and crosswalks. (Credit: Michele Weisbart)

ON-STREET PARKING NEAR INTERSECTIONS

On-street parking should be positioned far enough away from intersections to allow for good visibility of pedestrians preparing to cross the street. Curb extensions allow parking to be placed closer to the intersection.

RIGHT-TURN CHANNELIZATION ISLANDS

Right-turn lanes should generally be avoided as they increase the size of the intersection, the pedestrian crossing distance, and the likelihood of right-turns-on-red by inattentive motorists who do not notice pedestrians on their right. However, where there are heavy volumes of right turns (approximately 200 vehicles per hour or more), a right-turn lane may be the best solution to provide additional vehicle capacity without adding additional lanes elsewhere in the intersection. For turns onto roads with only one through lane and where truck turning movements are rare, providing a small corner radius at the right-turn lane often provides the best solution for pedestrians' safety and comfort.

At intersections of multi-lane roadways where trucks make frequent right turns, a raised channelization island between the through lanes and the right-turn lane is a good alternative to an

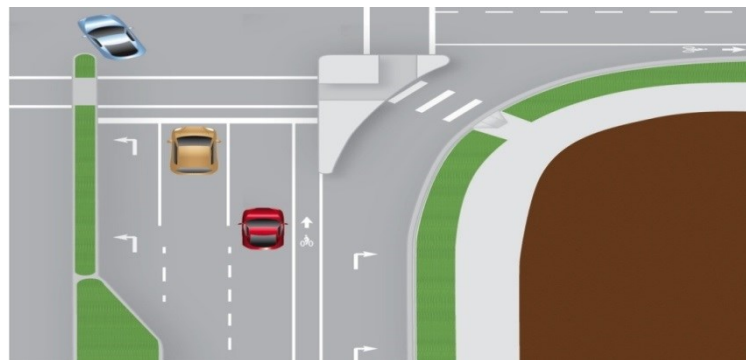
overly large corner radius and enhances pedestrian safety and access. If designed correctly, a raised island can achieve the following objectives:

- Allow pedestrians to cross fewer lanes at a time
- Allow motorists and pedestrians to judge the right turn/pedestrian conflict separately
- Reduce pedestrian crossing distance, which can improve signal timing for all users
- Balance vehicle capacity and truck turning needs with pedestrian safety
- Provide an opportunity for landscape and hardscape enhancement

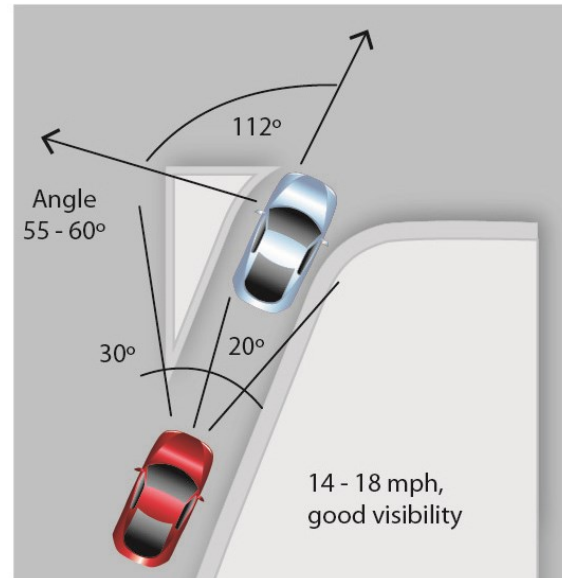
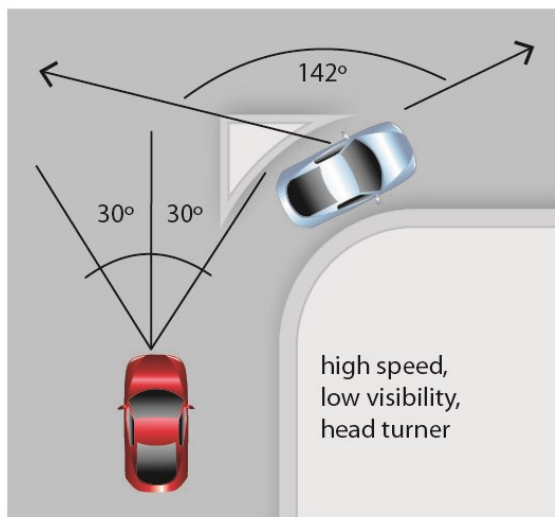
The following design practices for right-turn lane channelization islands should be used to provide safety and convenience for pedestrians, bicyclists, and motorists:

- Provide a YIELD sign for the slip lane
- Provide at least a 60-degree angle between vehicle flows, which reduces turning speeds and improves the yielding driver's visibility of pedestrians and vehicles
- Place the crosswalk across the right-turn lane about one car length back from where drivers yield to traffic on the other street, allowing the yielding driver to respond to a potential pedestrian conflict first, independently of the vehicle conflict, and then move forward, with no more pedestrian conflict

These goals are best accomplished by creating an island that is roughly twice as long as it is wide. The corner radius will typically have a long radius (150 feet to 300 feet) followed by a short radius (20 feet to 50 feet). When creating this design, it is necessary to allow large trucks to turn into multiple receiving lanes. This design is often not practical for right-turn lanes onto roads with only one through lane. This right-turn channelization design is different from designs that provide free-flow movements (through a slip lane) where right-turning motorists turn into an exclusive receiving lane at high speed. Right turns should be signal-controlled in this situation to provide for a signalized pedestrian walk phase.



Traffic channelization is an effective mitigation strategy when intersection radii reduction is not an option. (Credit: Michele Weisbart)



*Sharper angles of slip lanes are important to slow cars and increase visibility
(Credit: Michele Weisbart)*

YIELD AND STOP CONTROLLED INTERSECTIONS

Intersection control options include the following:

- YIELD control, which is under-utilized and should be considered to reduce unnecessary stops caused by the overuse of STOP signs.
- Uncontrolled intersections are YIELD controlled by default.
- Two-way STOP control, the most common form of intersection control. This is also an overused device. At many intersections a neighborhood traffic calming circle is a preferable and more effective option.
- All-way STOPs are often overused, incorrectly, to slow traffic. The use of all-way STOPs should be consistent with the MUTCD. At many intersections a neighborhood traffic calming circle is a preferable and a more effective option.

SIGNALIZED INTERSECTIONS

Signalized intersections provide unique challenges and opportunities for livable communities and complete streets. On one hand, signals provide control of pedestrians and motor vehicles with numerous benefits. Where signalized intersections are closely spaced, signals can be used to control vehicle speeds by providing appropriate signal progression on a corridor. Traffic signals allow pedestrians and bicyclists to cross major streets with only minimal conflict with motor vehicle traffic. On the other hand, traffic signals create challenges for non-motorized users. Signalized intersections often have significant turning volumes, which conflict with concurrent pedestrian and bicycle movements. In many cases, roundabouts can offer safer, more convenient intersection treatment than signals.

To improve livability and pedestrian safety, signalized intersections should:

- Provide signal progression at speeds that support the target speed of a corridor whenever feasible
- Provide short signal cycle lengths, which allow frequent opportunities to cross major roadways, improving the usability and livability of the surrounding area for all modes
- Ensure that signals detect bicycles
- Place pedestrian signal heads in locations where they are visible
- At locations with many crossing pedestrians, time the pedestrian phase to be on automatic recall, so pedestrians don't have to seek and push a pushbutton.
- Where few pedestrians are expected and automatic recall of walk signals is not desirable, place pedestrian pushbuttons in convenient locations, using separate pedestals if necessary. Use the recommendations regarding pushbutton placement for accessible pedestrian signals found in the Manual on Uniform Traffic Control Devices (MUTCD).
- Include pedestrian signal phasing that increases safety and convenience for pedestrians, as discussed in more detail below

OPERATIONAL DESIGN

Approximately two percent of intersections are signalized, and approximately 20 percent of all intersection crashes occur at signalized intersections. Unfortunately, in many locations signalization is the only option because of right-of-way limitations, high vehicle volumes, and the need to create gaps to provide reasonable operation for all users.



*Pole-mounted signal
(Credit: Ryan Snyder)*

Over the years, the most common signal hardware has changed from post-mounted signals to overhead mast arms. This change has lifted drivers' eyes upward and away from pedestrians and bicyclists at street level. In urban areas the large mast arms can be intrusive. As part of the conversion to healthier streets, changing to post-mounted signals in urban areas could lower the cost of installing and maintaining signals, reduce the vision intrusion, and help lower a driver's vision back to pedestrians. The designer should implement this sort of change as part of future construction as long as all of the requirements pertaining to signal head visibility contained within the MUTCD are met. There are two advantages for pedestrians and bicyclists to pole-mounted signals:

- Drivers have to stop back from the crosswalk to see the indication so they are less likely to encroach into the crosswalk, and more likely to see pedestrians and bicyclists when turning right.
- Mast-arm signals encourage higher speeds since drivers can see several in a row. If they are green, drivers are more likely to accelerate. However, pole-mounted signals are only visible to drivers closer to the intersection, causing them to drive slower on the approach.

SIGNAL PHASING

A signal phase is defined as the cycle length allocated to a traffic movement at an intersection receiving the right-of-way, or to any combination of traffic movements receiving the right of way simultaneously. The combination of all phases is equal to one cycle length.

Basic Signal Timing

The “timing” is the time in seconds allocated to various vehicular and pedestrian movements. A traffic control signal transmits information to the users by selective illumination of different color lights at a signalized intersection. The illuminated color indicates the user should take a specific action at the signalized intersection:

- **Green time.** Green time is when motorists and bicyclists may proceed through the intersection.
- **Yellow time.** Yellow time is the cycle phase before changing to the red interval that prohibits traffic movement. It signifies to users the light is about to turn red and they should stop if they can safely do so, or continue proceeding if that is safer. A properly timed yellow time interval is important to reduce signal violations by users passing through the intersection.
- **All-red time.** All-red time is that portion of a traffic cycle time where all vehicles are prohibited from any movements at the intersection. The all-red time follows the yellow time interval and precedes the next green interval. The purpose of the all-red time is to allow vehicles that entered the intersection late during the yellow time to clear the intersection before the traffic signal displays green time for conflicting approaches.

Left-Turn Phasing

The most commonly used “left turn” phases at an intersection with a left-turn lane are:

- **Permissive.** Under permissive left turn phasing, through traffic may proceed straight through the intersection with a green ball, as side traffic is stopped (with a red ball); the left turning vehicles are permitted to make the turn when they find a safe and adequate gap from the approaching vehicles. Left-turn movements are controlled either with the green ball or a flashing yellow arrow depending on whether an exclusive left-turn lane exists. Permissive left turn phases create conflicts with pedestrians crossing the street as the timing puts the two on a collision course.
- **Protected-permissive.** Under protected-permissive left turn phasing, left turns are allowed to pass the intersection with a green arrow first during the protected phase (opposing through traffic is stopped); usually three to five vehicles are allowed in the cycle before the left turn is changed from a left arrow to a green ball, and opposing through traffic is allowed to pass through the intersection. During the permissive phase motorists may turn left while others go straight. Left-turn movements during the permissive phase are controlled either with the green ball or a flashing yellow arrow depending on whether an exclusive left-turn lane exists. Protected-permissive left turn phases create conflicts with pedestrians crossing the street as the timing puts the two on a

collision course, especially with left-turning drivers who arrived after the left-turn phase and are impatient to turn left before the signal reverts to red.

- **Protected only.** Under protected left turns, drivers can only turn left with a left-turn green arrow. The protected left turns can be either “leading” or “lagging.” A leading protected left turn allows left-turns during the beginning of the cycle. A lagging protected left allows left turns at the end, after opposing through traffic has proceeded. Protected left-turn phases are preferred to both permissive phases because they eliminate the inherent conflict between left turning vehicles and pedestrians. Protected left turns, controlled by green arrows, provide the greatest safety for pedestrians. Permissive phases are typically added to protected only phasing to provide additional capacity for motorists.

Pedestrian Phasing

Basic pedestrian signal timing principles should be combined with innovative pedestrian signal timing techniques to enhance pedestrian safety and convenience.

Pedestrian signal heads provide indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DON'T WALK). Pedestrian signal head indications have the following meanings:

- A steady WALKING PERSON (WALK) signal indication means that a pedestrian facing the signal indication is permitted to start to cross the roadway in the direction of the signal indication, possibly in conflict with turning vehicles.
- A flashing UPRAISED HAND (DON'T WALK) signal indication means that a pedestrian shall not start to cross the roadway in the direction of the signal indication, but that any pedestrian who has already started to cross shall proceed to the far side of the traveled way of the street or highway, unless otherwise directed by a traffic control device to proceed only to a median or pedestrian refuge area.
- A steady UPRAISED HAND (DON'T WALK) signal indication means that a pedestrian shall not enter the roadway in the direction of the signal indication.

The text below discusses the timing of each of these indicators.

Walk Interval

The WALK interval (white walking person) must typically be a minimum of 7 seconds. However, to provide more convenience for pedestrians, and possibly more safety due to better pedestrian behavior, the WALK interval should be maximized using the following techniques:

- Instead of providing the minimum WALK interval, maximize the WALK interval within the available green interval. This is accomplished by subtracting the necessary pedestrian clearance interval (discussed below) from the available green time for the concurrent vehicular movements.

- Except at intersections where pedestrians are relatively few, and anywhere that vehicle signals are set on fixed time, WALK intervals should be set on “recall” so that they are automatically provided during every signal cycle.
- Where a major street intersects a minor side street, the WALK interval for crossing the minor street can be set on recall, concurrent with the green interval for the parallel through vehicle movement, which is typically set to recall as well. This minimizes pedestrian delay along the major street with no impact to motor vehicle capacity.

Walk Signal
(Credit: David Riesland)

Pedestrian Clearance Interval

The procedures for calculating the timing of the pedestrian clearance interval (flashing orange hand) are included in the MUTCD, but have recently changed. The pedestrian clearance interval is calculated to allow a pedestrian traveling at a walking speed of 3.5 feet per second to travel the length of the crosswalk. The crosswalk length should be measured from the center of one curb ramp to the center of the opposing curb ramp. This speed allows pedestrians, especially seniors, children, and disabled people, to clear the intersection. The MUTCD includes another test that requires the total of the WALK interval plus the pedestrian clearance interval to be sufficient to allow a pedestrian traveling at a walking speed of 3 feet per second to travel the length of the crosswalk, measured from the top of one ramp to the bottom of the opposing ramp. Any additional time that is required to satisfy this second requirement should be added to the walk interval. In neighborhoods where high numbers of slow pedestrians are present, such as near senior centers, rehabilitation centers, and disabled centers, the interval should be set for even slower speeds.



Pedestrian Countdown Signal
(Credit: David Riesland)

The MUTCD also requires that countdown pedestrian signals be installed for all pedestrian signals. These signals count down the pedestrian clearance interval and provide more information to pedestrians, allowing them to more easily adjust their walking patterns to ensure they are out of the crosswalk before the end of the pedestrian clearance interval. Research on pedestrian countdown signals has determined:

- Pedestrians understand how they work.
- Fewer people start walking in the pedestrian clearance interval.
- Very few pedestrians are left in the crosswalk during the steady orange hand.
- Drivers don't accelerate to beat the light.
- Research in San Francisco shows a 25 percent reduction in all crashes.

Other Signal Design Changes for Pedestrians

Where appropriate, use signal timing and operations techniques that minimize conflicts with pedestrians and motor vehicles, including the following:

- Protected only left-turn phases
- Leading pedestrian intervals (LPI) where the pedestrian WALK interval is displayed 2 to 5 seconds prior to the concurrent green interval. This enables pedestrians to enter the crosswalk before drivers turn, increasing their chances of being seen by drivers.
- Prohibiting right-turns-on-red where there are restricted sight lines between motorists and pedestrians, where there are an unusual number of pedestrian conflicts with turns on red compared to right-turns-on-green, or where a leading pedestrian interval is used
- Signs that remind drivers to yield to pedestrians when turning at signals
- Pedestrian-user-friendly-intelligent signals, which detect slower pedestrians in crosswalks and add clearance interval time to the pedestrian signal
- Pedestrian scrambles, which stop traffic on all legs of the intersection and allow pedestrians to cross diagonally, may be used where turning vehicles conflict with very high pedestrian volumes. Although pedestrians can cross in any direction during the pedestrian phase, pedestrians typically have to wait for both vehicle phases before they get the walk signal again. Scramble intersections can incorporate a walk phase concurrent with the green phase for pedestrians continuing along a straight path to eliminate this delay.

ROUNDBABOUTS

Modern roundabouts are potentially the cheapest, safest, and most aesthetic form of traffic control for many intersections. A roundabout is an intersection design with the following characteristics and features.

Users approach the intersection, slow down, stop and/or yield to pedestrians in a crosswalk, and then enter a circulating roadway, yielding to drivers already in the roundabout. The circulating roadway encircles a central island around which vehicles travel counterclockwise. Splitter islands force drivers to turn right, and provide a refuge for pedestrians. Deflection encourages slow traffic speeds, but allows movement by trucks. A landscaped visual obstruction in the central island obscures the driver's view of the road ahead, to discourage users from entering the roundabout at high speeds. Pedestrians are not allowed to access the central island, which should not contain attractions. The central island can vary in shape from a circle to a “square-a-bout” in historic areas, ellipses at odd shaped intersections, dumbbell, or even peanut shapes.

Each leg of a roundabout has a triangular splitter island that provides a refuge for pedestrians, prevents drivers from turning left (the “wrong-way”), guides drivers through the roundabout by



directing them to the edge of the central island, and helps to slow drivers. Roundabouts can range from quite small to quite large, from a central island diameter of about 12 feet for a traffic calming device at a neighborhood intersection to 294 feet to the back of sidewalk on a large multi-lane roundabout.

This section of the chapter briefly describes

roundabout application and design information. For more detailed information, refer to NCHRP Report 672, *Roundabouts: An Informational Guide*, Second Edition, 2010.

ADVANTAGES AND DISADVANTAGES

Roundabouts reduce vehicle-to-vehicle and vehicle-to-pedestrian conflicts and, thanks to a substantial reduction in vehicle speeds, reduce all forms of crashes and crash severity. In particular, roundabouts eliminate the most dangerous and common crashes at signalized intersections: left-turn and right-angle crashes.

Other benefits of roundabouts include the following:

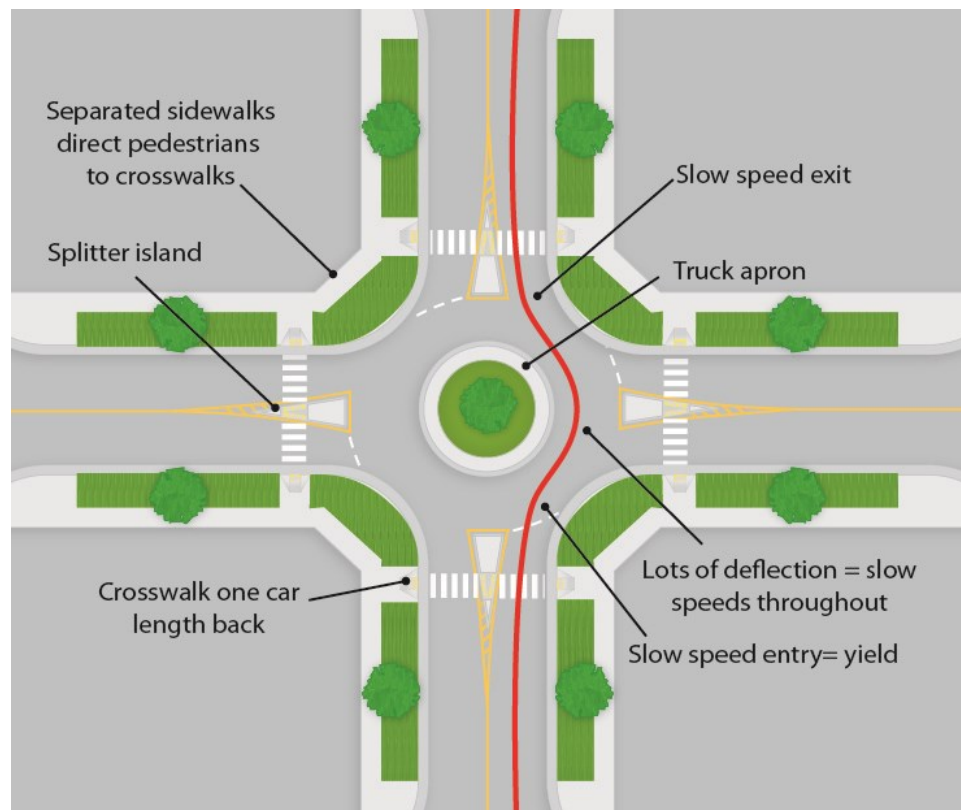
- Little to no delay for pedestrians, who have to cross only one direction of traffic at a time
- Improved accessibility to intersections for bicyclists through reduced conflicts and vehicle speeds
- A smaller carbon footprint (no electricity is required for operation and fuel consumption is reduced as motor vehicles spend less time idling and don't have to accelerate as often from a complete stop)
- The opportunity to reduce the number of vehicle lanes between intersections (e.g., to reduce a five-lane road to a two-lane road, due to increased vehicle capacity at intersections)
- Little to no stopping during periods of low flow
- Significantly reduced maintenance and operational costs because the only costs are related to the landscape and litter control
- Reduced delay, travel time, and vehicle queue lengths
- Lowered noise levels
- Less fuel consumption and air pollution
- Simplified intersections
- Facilitated U-turns
- The ability to create a gateway and/or a transition between distinct areas through landscaping
- When constructed as a part of a new road or the reconstruction of an existing road, the cost of a roundabout is minimal and can be cheaper than the construction of an intersection and the associated installation of traffic signals and additional turn lanes
- Light rail can pass through the center of a roundabout without delay because rail has the right of way

The primary disadvantage is that sight-impaired people can have difficulty navigating around large roundabouts. However, this can be mitigated with ground level wayfinding devices.

GENERAL DESIGN ELEMENTS OF ROUNDABOUTS

Central Island

The design of the central island is an important element of a roundabout. In conjunction with well-designed approach and departure lanes, the central island controls vehicle speeds through deflection and controls the size of vehicles that can pass through and turn at a roundabout. It provides space for landscaping to beautify an intersection or create a focal point or community enhancement, but it also provides space for the inclusion of a vertical element such as a tree, which is important in providing long range conspicuity of a roundabout.



*Single-lane roundabout
(Credit: Michele Weisbart)*

Splitter Islands

Splitter islands and/or medians on each approach serve several functions. Most importantly, they provide a refuge for pedestrians crossing at the roundabout, breaking the crossing into two smaller crossings. This allows pedestrians to select smaller gaps and cross more quickly. Splitter islands and medians direct vehicles toward the edge of the central island and limit the ability of drivers to make left turns the wrong way into the circulating roadway. Splitter islands should have a minimum width of 6 feet, and preferably 8 feet, from the face-of-curb to the opposite face-of-curb.

Truck Apron

Because central islands must be made large enough to deflect and hence control the speed of passenger vehicles, they can limit the ability of trucks to pass through or turn at a roundabout. To accommodate large vehicles, a truck apron (a paved, load-bearing area) is included around

the edge of the central island. The truck apron is often paved with a fairly rough texture, and raised enough to discourage encroachment by smaller high-speed passenger cars. The truck apron should be 3 inches high.

Pedestrian Crossings

Pedestrian crossings are located one car length away from the circulating roadway to shorten the crossing distance, separate vehicle-to-pedestrian conflicts from vehicle-to-vehicle conflicts, and allow pedestrians to cross between waiting vehicles.

Signing and Marking

Signing and marking should be in compliance with the current version of the MUTCD. For detailed design guidance on roundabouts, refer to the NCHRP Report 672, *Roundabouts: An Informational Guide*, Second Edition, 2010. However, care must be taken to not over-sign roundabouts by including every sign allowed at roundabouts, except for needed directional signs; most roundabouts are designed so their function and use are self-explanatory.

ROUNDABOUT DESIGN CRITERIA

Before starting the design of a roundabout it is very important to determine the following:

- The number and type of lane(s) on each approach and departure as determined by a capacity analysis
- The design vehicle for each movement
- The presence of on-street bike lanes
- The goal/reason for the roundabout, such as crash reduction, capacity improvement, speed control, or creation of a gateway or a focal point
- Right-of-way and its availability for acquisition if needed
- The existence or lack of sidewalks
- The approach grade of each approach
- Transit, existing or proposed

OPERATIONS AND ANALYSIS

Roundabouts operate on the principle that drivers approach a roundabout and look left for any approaching vehicles that could conflict with their travel path. If there is no possible conflict, the approaching driver can enter the roundabout without delay. If there is a vehicle, or many conflicting vehicles, the approaching drivers stop and yield to the conflicting vehicle(s) on their left and wait for a safe gap to enter the roundabout.

In simple terms, a roundabout capacity analysis determines the number of vehicles seeking to enter a roundabout from each approach and the availability of gaps. Based on this gap acceptance analysis, the number and type of approach and departure lanes can be determined to provide the desired level of operation. Since roundabouts keep traffic moving they have potentially greater capacity than both signalized and STOP-controlled intersections.

SINGLE-LANE ROUNDABOUTS

Single-lane roundabouts can vary in size with central island diameters from 12 to 90 feet to fit a wide range of intersections and accommodate through movements and different turn movements by various design vehicles. As such, they can be used at a large number of intersections to achieve various objectives.

In some cases, roundabouts are constructed to accommodate through movements by large articulated trucks but do not permit them to make turn movements. However, they do accommodate turn movements by single unit trucks such as ladder trucks and garbage trucks. In some cases, restricting or not accommodating turn movements by articulated trucks enables the construction of a smaller roundabout without acquisition of right-of-way and with all the benefits of roundabouts at the cost of forcing the occasional large truck to take an alternate route.

Design

Following a careful assessment of the need to accommodate some or all design vehicle movements and the impact of that accommodation, the size of the roundabout is selected and a concept plan is prepared. The concept plan is then refined with the simultaneous application of design vehicle templates and design speed checks until a suitable design is prepared that meets design requirements. Pedestrian and bike facilities are as applicable and the overall design is refined with the signing and marking, along with construction details. In some cases, right turn lanes can be added to accommodate specific high right turn volumes.

MULTI-LANE ROUNDABOUTS

When single-lane roundabouts prove to be inadequate for the traffic volume, consideration should be given to using roundabouts that have two through lanes on the major street and a single lane on the minor street with or without additional turn lanes before automatically designing a full multilane roundabout. Because these roundabouts are larger than single-lane roundabouts, they often accommodate all turn movements by most large vehicles. However, it is still necessary to confirm the size and movements by the design vehicle(s) because these roundabouts often have to accommodate larger trucks or special vehicles.

With many old style freeway interchanges failing, often because of a lack of storage for turning vehicles, retrofitting a roundabout on both sides of the freeway can reduce congestion and improve pedestrian mobility without widening the freeway bridge. Sometimes, the retrofit of a standard interchange with roundabouts can reduce the space allocated to the interchange, freeing the land for other community uses.



*Multi-lane roundabout
(Credit: Michele Weisbart)*

Accessibility

Multi-lane roundabouts are more complex for pedestrians and bicyclists to use because of the additional lanes, slightly higher speeds, and longer crossing distances. Crossing by some pedestrians with disabilities is a more complex task. As a consequence, the current draft (Proposed Right-of-Way Accessibility Guidelines) PROWAG includes a requirement to install accessible pedestrian signals at all crosswalks across any roundabout approach with two or more lanes in one direction. The PROWAG requirement does not specify the type of signal except that it must be accessible, including a locator tone at the pushbutton, with audible and vibrotactile indications of the pedestrian walk interval.

Metering signals

Often a roundabout capacity is only exceeded during one peak period and often for only a short period. Rather than constructing a larger multi-lane roundabout, consideration should be given to constructing a smaller roundabout that is adequate for 23 hours a day and adding a metering signal for the short peak period when congestion can occur. A metering signal is similar to ramp metering where the approaching vehicle queue is metered and a part time signal is used to stop the conflicting vehicle flow to allow the congested approach to enter the roundabout. The result is a smaller, slower roundabout that is more appropriate for all users for most of the day.

Design

Multi-lane roundabouts are more complex to design. However, the design process is the same as for single-lane roundabouts: confirm the design vehicle for each movement, prepare a concept plan, and refine it with the simultaneous use of design vehicle templates or software like AutoTURN and speed curves.

MINI-ROUNDAOBOUTS

Mini-roundabouts are a new form of roundabout that includes a traversable central island and traversable splitter islands to accommodate large vehicles.

Appropriate Applications

Mini-roundabouts are used in low-speed urban environments, where operating speeds are 30 mph or less, and right-of-way constraints preclude the use of a standard roundabout. The design is based on passenger vehicles passing through the roundabout without travelling over the central island, whereas large vehicles will turn over the central island and in some cases, the splitter islands.

Design

The design of mini-roundabouts is similar to other roundabouts in that the design vehicle for each movement must be determined following a capacity analysis. The design is undertaken using the same combination of design vehicle templates and speed curves.

NEIGHBORHOOD TRAFFIC CIRCLES

Neighborhood traffic circles are very small circles that are retrofitted into local street intersections to control vehicle speeds within a neighborhood. Typically, a tree and/or landscaping are located within the central island to provide increased visibility of the roundabout and enhance the intersection. Neighborhood traffic circles should generally have similar features as roundabouts, including yield-on-entry and painted or mountable splitter islands.



Neighborhood traffic circle
(Credit: David Riesland)

Neighborhood traffic circles should be used on low-volume, neighborhood streets. In these environments, larger vehicles can turn left in front of the central island.

Design

The design of neighborhood traffic circles is primarily confined to selecting a central island size to achieve the appropriate design speed of around 15 to 18 mph. See Chapter 9, “Traffic Calming,” for more information.

5. UNIVERSAL PEDESTRIAN ACCESS

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INTRODUCTION

Nowhere is the concept of universal access more important than in the design of the pedestrian environment. While perhaps not intuitively obvious at first glance, this is the realm of streets with the greatest variation in user capabilities, and thus the realm where attention to design detail is essential to effectively balance user needs. This is also the realm where signs and street furniture are located, and where transitions are made between modes (e.g., driver or passenger to pedestrian via parking, bus stop/train station, or bike rack). The pedestrian environment includes sidewalks, curb ramps, crosswalks, bus stops, signs, and street furniture.

Without design guidelines, sidewalks are often too narrow, utility poles obstruct travel, steep driveway ramps are impassable to wheelchair users, and bus stops become blocked by the disorderly placement of shelters, poles, trash receptacles, and bike racks.



Sidewalks constructed without adequate design guidelines (Credit: Chanda Singh)

With well-defined guidelines, sidewalks are built to accommodate pedestrians of all ages and physical abilities, and become inviting pedestrian environments as the adjacent picture shows.

Designing the pedestrian realm for universal access enables persons with disabilities to live independently and lead full, enriched lives; they are able to go to work and to school, to shop, and otherwise engage in normal activities. Moreover, walking environments that accommodate people with disabilities improve walking conditions for everyone. People with strollers and rolling suitcases can make their way about with ease. Children can mature by learning to navigate through their neighborhoods with



Wheelchair users need accessible sidewalks (Credit: Dan Burden)

independence. Inaccessible pedestrian networks, on the other hand, can lead to people becoming housebound and socially isolated.

This chapter describes the legal framework for accessible design of streets and sidewalks, various users of streets and sidewalks and their needs, and important elements of pedestrian facility design. The chapter ends with sidewalk design guidelines for a number of street classifications.

ESSENTIAL PRINCIPLES OF UNIVERSAL PEDESTRIAN ACCESS

The following design principles inform the recommendations made in this chapter and should be incorporated into every pedestrian improvement:

- The walking environment should be safe, inviting, and accessible to people of all ages and physical abilities.
- The walking environment should be easy to use and understand.
- The walking environment should seamlessly connect people to places. It should be continuous, with complete sidewalks, well-designed curb ramps, and well-designed street crossings.

LEGAL FRAMEWORK

Under Title II of the Americans with Disabilities Act (ADA) of 1990, state and local governments and public transit authorities must ensure that all of their programs, services, and activities are accessible to and usable by individuals with disabilities. They must ensure that new construction and altered facilities are designed and constructed to be accessible to persons with disabilities. State and local governments must also keep the accessible features of facilities in operable working condition through maintenance measures including sidewalk repair, landscape trimming, work zone accessibility, and snow removal.

Under the ADA, the U.S. Access Board is responsible for developing the minimum accessibility guidelines needed to measure compliance with ADA obligations when new construction and alterations projects are planned and engineered. These guidelines for public rights-of-way are found in draft form in the Public Rights-of-Way Accessibility Guidelines (PROWAG). The U.S.



Obstructions can make passage difficult or impossible for wheelchair users. (Credit: Michael Ronkin)

Department of Transportation has recognized this document as current best practices in pedestrian design and has indicated its intent to adopt the final PROWAG.

In addition to the PROWAG guidelines, Title II of the ADA also requires states and localities to develop ADA Transition Plans that remove barriers to disabled travel. The City of Norman's Transition Plan was adopted... to ensure that existing inaccessible facilities are not neglected indefinitely. The Transition Plan includes:

- Inventory physical obstacles and their location
- Provide adequate opportunity for residents with disabilities to provide input into the Transition Plan
- Describe in detail the methods the entity will use to make the facilities accessible
- Provide a yearly schedule for making modifications
- Name an official/position responsible for implementing the Transition Plan
- Set aside a budget to implement the Transition Plan

USERS AND NEEDS

To fully accommodate everybody, designers must consider the widely varying needs and capabilities of the people in the community. People walk at different speeds. Some are able to endure long treks, while others can only go short distances. Some use wheelchairs and are particularly sensitive to uneven pavement and surface materials. Others have limited sight and rely on a cane. People's strengths, sizes, and judgmental capabilities differ significantly. The needs of one group of users may be at odds with those of another group of users. For instance, gradual ramps and smooth transitions to the street help people in wheelchairs, but present challenges for the sight-impaired when they can't easily find the end of the sidewalk and beginning of the street.

The text below identifies the unique constraints individuals with different types of disabilities and limitations face as pedestrians. Understanding their needs will help ensure more universal design of the sidewalk network.



*Steep cross slopes create difficulties for wheelchair users.
(Credit: Michael Ronkin)*

PEOPLE WITH MOBILITY IMPAIRMENTS

People with mobility impairments range from those who use assistive devices, such as wheelchairs, crutches, canes, orthotics, and prosthetic devices, to those who use no such devices but face constraints walking long distances on non-level surfaces or on steep grades.

Wheelchair and scooter users are most affected by the following:

- Uneven surfaces that hinder movement
- Rough surfaces that make rolling difficult and can cause pain, especially for people with back injuries
- Steep uphill slopes that slow the user
- Steep downhill slopes that cause a loss of control
- Cross slopes that make the assistive device unstable
- Narrow sidewalks that impede the ability of users to turn or to cross paths with others
- Devices that are hard to reach, such as push buttons for walk signals and doors
- The lack of time to cross the street

Walking-aid users are most affected by the following:

- Steep uphill slopes that make movement slow or impossible
- Steep downhill slopes that are difficult to negotiate
- Cross slopes that cause the walker to lose stability
- Uneven surfaces that cause these users to trip or lose balance
- Long distances
- Situations that require fast reaction time
- The lack of time to cross the street



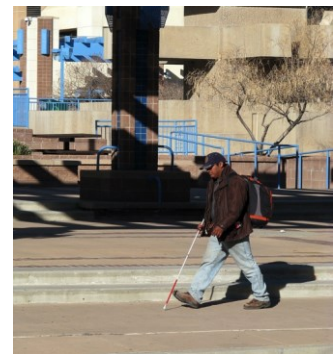
*Walking-aid users need clear sidewalks.
(Credit: Dan Burden)*

Prosthesis users often move slowly and have difficulty with steep grades or cross slopes.

PEOPLE WITH VISUAL IMPAIRMENTS

People with visual impairments include those who are partially or fully blind, as well as those who are colorblind. Visually impaired people face the following difficulties:

- Limited or no visual perception of the path ahead
- Limited or no visual information about their surroundings, especially in a new place
- Changing environments where they rely on memory
- Lack of non-visual information
- Inability to react quickly
- Unpredictable situations, such as complex intersections that are not at 90 degrees
- Inability to distinguish the edge of the sidewalk from the street
- Compromised ability to detect the proper time to cross a street
- Compromised ability to cross a street along the correct path
- Need for more time to cross the street



Sight-impaired pedestrians need additional sensory cues.

PEOPLE WITH COGNITIVE IMPAIRMENTS

People with cognitive impairments encounter difficulties in thinking, learning, and responding, and in performing coordinated motor skills. Cognitive disabilities can cause some to become lost or have difficulty finding their way. They may also not understand standard street signs and traffic signals. Some may not be able to read and benefit from signs with symbols and colors.

CHILDREN AND OLDER ADULTS

Children and many older adults don't fall under specific categories for disabilities, but must be taken into account in pedestrian planning. Children are less mentally and physically developed than adults and have the following characteristics:

- Less peripheral vision
- Limited ability to judge speed and distance
- Difficulty locating sounds
- Limited or no reading ability so don't understand text signs
- Occasional impulsive or unpredictable behavior
- Little familiarity with traffic
- Difficulty in carrying packages

Small children are also more difficult to see than adults.

The natural aging process generally results in at least some decline in sensory and physical capability. As a result, many older adults experience the following:

- Declining vision, especially at night
- Decreased ability to hear sounds and detect where they come from
- Less strength to walk up hills and less endurance overall
- Reduced balance, especially on uneven or sloped sidewalks
- Slowed reaction times to dangerous situations
- Slowed walking speed
- Increased fragility and frailty: their bodies are more likely to be seriously injured in a fall or vehicular crash and their recovery becomes longer and more tenuous. This makes older pedestrians the most vulnerable pedestrians.

PEDESTRIAN FACILITY DESIGN

To provide a seamless path of travel throughout the community that is accessible to all, designers should consider five important elements: sidewalks, curb ramps, crosswalks, signals, and bus stops.

SIDEWALKS

Sidewalks should provide a comfortable space for pedestrians between the roadway and adjacent land uses. Sidewalks along city streets are the most important component of pedestrian mobility. They provide access to destinations and critical connections between modes of travel, including automobiles, transit, and bicycles. General provisions for sidewalks include pathway width, slope, space for street furniture, utilities, trees and landscaping, and building ingress/egress.

Sidewalks include four distinct zones: the frontage zone, the pedestrian (aka walking) zone, the furniture zone, and the curb zone. The minimum widths of each of these zones vary based on street classifications as well as land uses. The Street Classifications section in this chapter describes these recommendations in more detail as applied to individual cities. The table at the end of this chapter recommends minimum widths for each zone for different street types and land uses.

Frontage Zone

The frontage zone is the portion of the sidewalk located immediately adjacent to buildings, and provides comfort distance from buildings, walls, fences, or property lines. It includes space for building-related features such as entryways and accessible ramps. It can include landscaping as well as awnings, signs, news racks, benches, and outdoor café seating (requires 2.5 foot minimum width). In single family residential neighborhoods, landscaping typically occupies the frontage zone.

Pedestrian Zone

The pedestrian zone, situated between the frontage zone and the furniture zone, is the area dedicated to walking and should be kept clear of all fixtures and obstructions. Within the pedestrian zone, the Pedestrian Access Route (PAR) is the path that provides continuous connections from the public right-of-way to building and property entry points, parking areas, and public transportation. This pathway is required to comply with ADA guidelines and is intended to be a seamless pathway for wheelchair and white cane users. As such, this route should be firm, stable, and slip-resistant, and should comply with maximum cross slope requirements (2 percent grade). The walkway grade shall not exceed the general grade of the adjacent street. Aesthetic textured pavement materials (e.g., brick and pavers) can only be used in the frontage and furniture zones. The PAR should be a minimum of 4 feet, but preferably at least 5 feet in width to provide adequate space for two pedestrians to comfortably pass or walk side by side. All transitions (e.g., from street to ramp or ramp to landing) must be flush and free of changes in level. The engineer should determine the pedestrian zone width to accommodate the projected volume of users. In no case will this zone be less than the width of the PAR.

Non-compliant driveways often present significant obstacles to wheelchair users. The cross slope on these driveways is often much steeper than the 2 percent maximum grade. Driveway aprons that extend into the pedestrian zone can render a sidewalk impassable to users of wheelchairs, walkers, and crutches. They need a flat plane on which to rest all supports. To

provide a continuous PAR across driveways, aprons should be confined to the furniture and curb zones.

Furniture Zone

The furniture zone is located between the curb line and the pedestrian zone. The furniture zone should contain all fixtures, such as street trees, bus stops and shelters, parking meters, utility poles and boxes, lamp posts, signs, bike racks, news racks, benches, waste receptacles, drinking fountains, and other street furniture to keep the pedestrian zone free of obstructions. In residential neighborhoods, the furniture zone is often landscaped. Resting areas with benches and space for wheelchairs should be provided in high volume pedestrian districts and along blocks with a steep grade to provide a place to rest for older adults, wheelchair users, and others who need to catch their breath.

Curb Zone

The curb zone serves primarily to prevent water and cars from encroaching on the sidewalk. It defines where the area for pedestrians begins, and the area for cars ends. It is the area people using assistive devices must traverse to get from the street to the sidewalk, so its design is critical to accessibility.

Other Sidewalk Guidelines

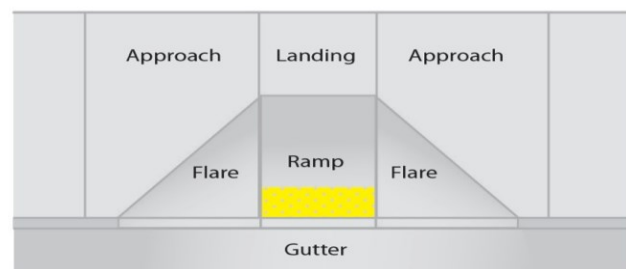
- Landscaped buffers or fences should separate sidewalks from off-street parking lots or off-street passenger loading areas.
- Pedestrian and driver sight distances should be maintained near driveways. Fencing and foliage near the intersection of sidewalks and driveways should ensure adequate sight distance as vehicles enter or exit.
- Where no frontage zone exists, driveway ramps usually violate cross slope requirements. In these situations, sidewalks should be built back from the curb at the driveway as shown in the adjacent photo.



Routing sidewalks around driveway ramps maintains a flush surface. (Credit: Dan Burden)

CURB RAMPS

Proper curb ramp design is essential to enable pedestrians using assistive mobility devices (e.g., scooters, walkers, and crutches) to transition between the street and the sidewalk. These design guidelines provide a basic overview of curb ramp



(Credit: Michele Weisbart)

design. The ADA requires installation of curb ramps in new sidewalks and whenever an alteration is made to an existing sidewalk or street. Roadway resurfacing is considered an alteration and triggers the requirement for curb ramp installations or retrofits to current standards. Curb ramps are typically installed at intersections, mid-block crossings (including trail connections), accessible on-street parking, and passenger loading zones and bus stops.

The following define the curb ramp components along with minimum dimensions:

- **Landing** – the level area at the top of a curb ramp facing the ramp path. Landings allow wheelchairs to enter and exit a curb ramp, as well as travel along the sidewalk without tipping or tilting. This landing must be the width of the ramp and measure at least 4 feet by 4 feet. There should also be a level (not exceeding a 2 percent grade) 4 foot by 4 foot bottom landing of clear space outside of vehicle travel lanes.
- **Approach** – the portion of the sidewalk on either side of the landing. Approaches provide space for wheelchairs to prepare to enter landings.
- **Flare** – the transition between the curb and sidewalk. Flares provide a sloped transition (10 percent maximum slope) between the sidewalk and curb ramp to help prevent pedestrians from tripping over an abrupt change in level. Flares can be replaced with curb where the furniture zone is landscaped.
- **Ramp** – the sloped transition between the sidewalk and street where the grade is constant and cross slope at a minimum. Curb ramps are the main pathway between the sidewalk and street.
- **Gutter** – the trough that runs between the curb or curb ramp and the street. The slope parallel to the curb should not exceed 2 percent at the curb ramp.
- **Detectable Warning** – surface with distinct raised areas to alert pedestrians with visual impairments of the sidewalk-to-street transition.

There are several different types of curb ramps. Selection should be based on local conditions. The most common types are diagonal, perpendicular, parallel, and blended transition. PROWAG provides additional design guidance and curb ramp examples appropriate for a variety of contextual constraints.

Diagonal Curb Ramps

Diagonal curb ramps are single curb ramps at the apex of the corner. These have been commonly installed by many jurisdictions to address the requirements of the ADA, but have since been identified as a non-preferred design type as they introduce dangers to wheelchair users. Diagonal curb ramps send wheelchair users and people with strollers or carts toward the middle of the intersection and make the trip across longer. This design is no longer allowed in Norman.

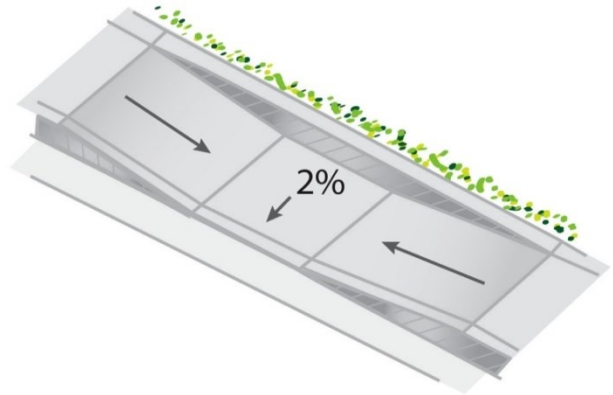
Perpendicular Curb Ramps

Perpendicular curb ramps are placed at a 90-degree angle to the curb. They must include a level landing at the top to allow wheelchair users to turn 90 degrees to access the ramp, or to bypass

the ramp if they are proceeding straight. Perpendicular ramps work best where there is a wide sidewalk, curb extension, or planter strip. Perpendicular curb ramps provide a direct, short trip across the intersection.

Parallel Curb Ramps

Parallel curb ramps are oriented parallel to the street; the sidewalk itself ramps down. They are used on narrow sidewalks where there isn't enough room to install perpendicular ramps. Parallel curb ramps require pedestrians who are continuing along the sidewalk to ramp down and up. Where space exists in a planting strip, parallel curb ramps can be designed in combination with perpendicular ramps to reduce the ramping for through pedestrians. Careful attention must be paid to the construction of the bottom landing to limit accumulation of water and/or debris.



*Parallel curb ramp
(Credit: Michele Weisbart)*

Curb Ramp Placement

For best practices in ramp placement, refer to Chapter 4, “Intersection Design.”

One ramp must be provided for each crosswalk, which usually translates to two per corner. This maximizes access by placing ramps in line with the sidewalk and crosswalk, and by reducing the distance required to cross the street, compared with a single ramp on the apex.

Blended Transitions

Blended transitions are situations where either the entire sidewalk has been brought down to the street or crosswalk level, or the street has been brought up to the sidewalk level. They work well on large radius corners where it is difficult to line up the crosswalks with the curb ramps, but have drawbacks. Children, persons with cognitive impairments, and guide dogs may not distinguish the street edge. Turning vehicles may also encroach onto the sidewalk. For these reasons, bollards, planting boxes, or other intermittent barriers must be installed to prevent cars from traveling on the sidewalk. Detectable warnings should also be placed at the edge of the sidewalk to alert pedestrians with visual impairments of the transition to the street. Municipalities should follow the standards and guidelines for curb ramps provided in Table 5.1.

Table 5.1 Curb Ramp Design Standards and Guidelines

Curb Ramp Type	Characteristic	ADA Standards	PROWAG
Perpendicular	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2%	2%
	Maximum slope of flared sides	10%	10%
	Minimum ramp width	36"	48"
	Minimum landing length	36"	48"
	Minimum landing width		48"
	Maximum gutter slope	5%	5%
	Changes in level	Flush	Flush
	Truncated domes	Full depth and width	24" min.
Parallel and combination	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2%	2%
	Maximum slope of flared sides	10%	
	Minimum ramp width	36"	48"
	Minimum landing length	36"	
	Minimum landing width		48"
	Maximum landing slope		2%
	Maximum gutter slope	5%	5%
	Changes in level	Flush	Flush
	Truncated domes	Full depth and width	24"
Curb extensions and built-up	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2%	2%
	Maximum slope of flared sides	10%	10%
	Minimum ramp width	36"	48"
	Minimum landing length	36"	48"
	Minimum landing width		48"
	Maximum gutter slope	5%	5%
	Changes in level	Flush	flush
	Detectable warnings	Full depth and width	24"

DETECTABLE WARNINGS

Because a curb ramp removes the curb that visually impaired persons use to identify the location of a street, a detectable warning surface must be placed at the back of the curb. This detectable strip should be as wide as the ramp and a minimum of 24 inches deep. One corner should be located at the back of the curb and the other corner may be up to 5 feet from the back of the curb. These strips are most effective when adjacent to smooth pavement so the difference is easily detected. Color contrast is needed so partially sighted people can see them.



*Required Truncated Domes
(Credit: David Riesland)*

The ADAAG standards for detectable warnings are as follows:

- General: Detectable warnings shall consist of a surface of truncated domes and shall meet standards for size, spacing, contrast and edges
- Base diameter: 0.9 inches minimum; 1.4 inches maximum
- Top diameter: 50 percent of base diameter minimum to 65 percent maximum
- Height: 0.2 inches
- Center-to-center spacing: 1.6 inches minimum to 2.4 inches maximum
- Base-to-base spacing: 0.65 inches minimum
- Visual contrast: light on dark, or dark on light with adjacent walking surface
- Platform edges: 24 inches wide and shall extend the full public use area of the platform

PROWAG best practices include the following:

- Width: as wide as the ramp and 24 inches deep
- Location: one corner at back of the curb, the other corner up to 5 feet from back of curb
- Used at:
 - The edge of depressed corners
 - The border of raised crosswalks and intersections
 - The base of curb ramps
 - The border of medians
 - The edge of transit platforms and where railroad tracks cross the sidewalk

SIGNALS

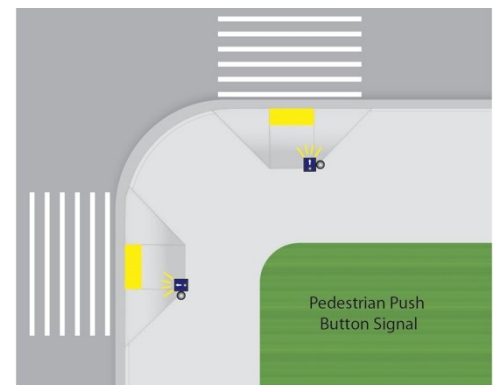
Signalized street crossings require special consideration of people with disabilities. The following text provides guidance to do that.

Crossing Times

In planning for people with disabilities, slower speeds must be considered. This is critical in setting the timing of the walk phase of signalized intersections. The Manual on Uniform Traffic Control Devices (MUTCD) requires that transportation agencies use common walking speeds for signal timing. Deviations from these common walking speeds are allowed for a variety of features specific to a certain intersection such as terrain. The use of emerging technologies is encouraged to best accommodate pedestrian movements through signalized intersections.

Pedestrian-Activated Push Buttons

Pedestrian-activated traffic controls require pedestrians to push a button to activate a walk signal. Where pedestrian-activated traffic controls exist, they should be located as close as possible to curb ramps without reducing the width of the path. The buttons should be at a level that is easily reached by people in wheelchairs near the top of the ramp. The U.S. Access Board guidelines recommend buttons raised above or flush with their housing and large enough (a minimum of 2 inches) for people with visual impairments to see them. The buttons should also be easy to push.



Pedestrian push button placement (Credit: Michele Weisbart)

Accessible Pedestrian Signals (APS)

Wayfinding for pedestrians with visual impairments is significantly improved with the use of APS at signalized intersections. In fact, APS are the most commonly requested accommodation under Section 504 of the Rehabilitation Act of 1973. APS systems communicate information about pedestrian timing in non-visual formats such as audible tones, verbal messages, and/or vibrating surfaces. Verbal messages provide the most informative guidance. These devices should be installed close to the departure location and on the side away from the center of the intersection. Since they are typically only audible 6 to 12 feet from the push button, 10 feet should separate two APS devices on a corner. If two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole, each accessible pedestrian pushbutton shall be provided with a pushbutton locator tone, a tactile arrow, a speech walk message for the WALKING PERSON (symbolizing WALK) indication, and a speech pushbutton information message. Volumes of the walk indication and push button locator tone shall automatically adjust in response to ambient sound.

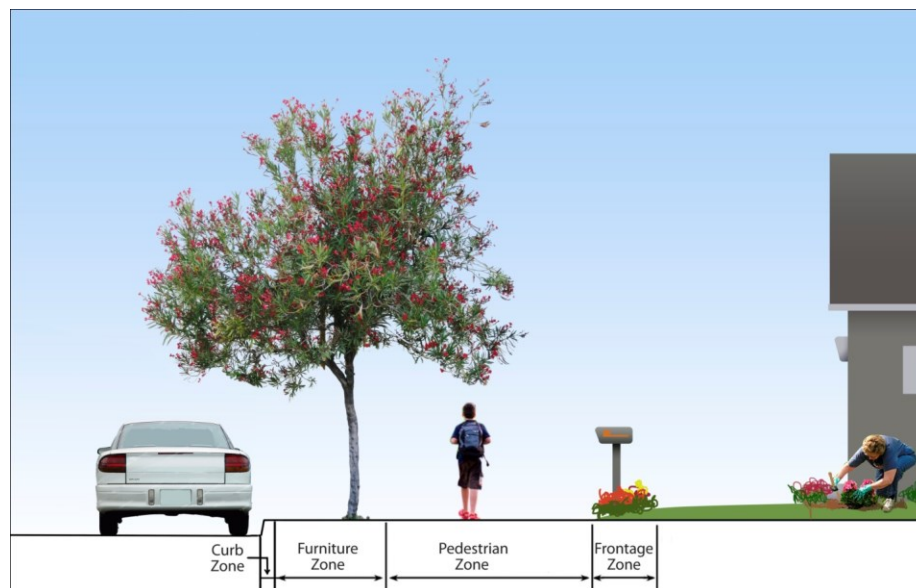
LAND USE AND SIDEWALK DESIGN GUIDELINES

The sidewalk design guidelines in this chapter integrate design and land use to provide safe and convenient passage for pedestrians. Sidewalks should have adequate walking areas and provide comfortable buffers between pedestrians and traffic. These guidelines will ensure sidewalks in all development and redevelopment provide access for people of all ages and physical abilities.

Sidewalks will vary according to the type of street. A local street with residences will require different sidewalk dimensions than an arterial with commercial establishments. The descriptions below indicate the type of pedestrian activity expected at each of the specified land uses. The graphics (credit Marty Bruinsma) illustrate the minimum widths of the sidewalk zones for each of the contexts. The matrix in the following section provides specific minimum requirements for the four sidewalk zones according to combinations of land use and street classifications.

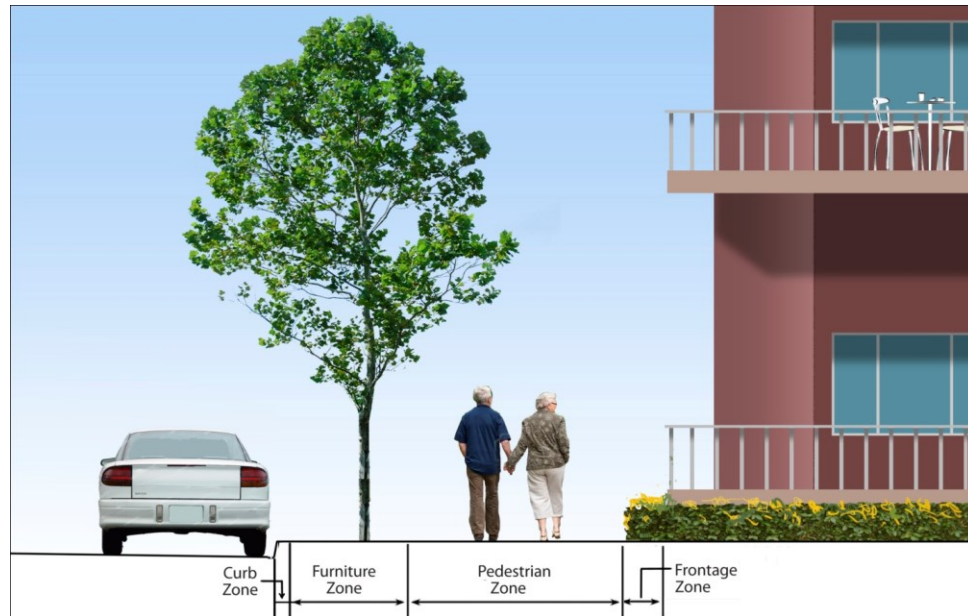
LOW / MEDIUM DENSITY RESIDENTIAL

These streets are typically quieter than others and generally do not carry transit vehicles or high volumes of traffic. Pedestrians require a pleasant walking environment within these neighborhoods, as well as to access land uses and transit on nearby streets. Of the four sidewalk zones, the furniture zone is often the widest, to provide room for street trees.



MEDIUM / HIGH DENSITY RESIDENTIAL

These streets support greater volumes of pedestrians. Streets with transit service require good pedestrian links to bus stops. The pedestrian zone should be wider than in low/medium density residential.



NEIGHBORHOOD COMMERCIAL

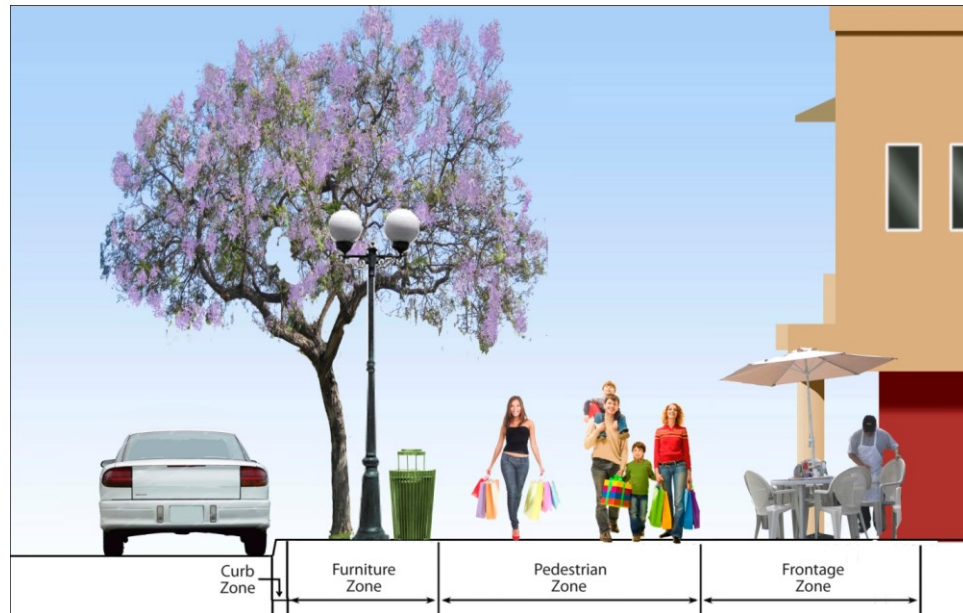
These streets often have grocers, laundromats, drug stores, and other neighborhood-serving retail establishments. Sidewalks in neighborhood commercial areas should accommodate pedestrians walking from residences to stores. Of the four sidewalk zones, the pedestrian zone should be the widest, with a generous frontage zone to provide room for features next to buildings such as newspaper boxes. These sidewalks should also be designed with the understanding that cars will cross sidewalks as they enter and exit commercial driveways.

GENERAL / REGIONAL COMMERCIAL

These streets have retail, office, civic, and recreational uses concentrated along boulevards and avenues. Transit service runs along these streets and pedestrians need buffers from traffic. Of the four sidewalk zones, the pedestrian and furniture zones are favored. These sidewalks also should be designed with the understanding that a significant number of cars will cross sidewalks as they enter and exit commercial driveways.

MIXED / MULTI-USE

The sidewalks along these streets should support significant pedestrian volumes due to their integrated nature and higher densities. Of the four sidewalk zones, the pedestrian and frontage zones will be favored. Transit service runs along these streets and sidewalks will require buffers from traffic.

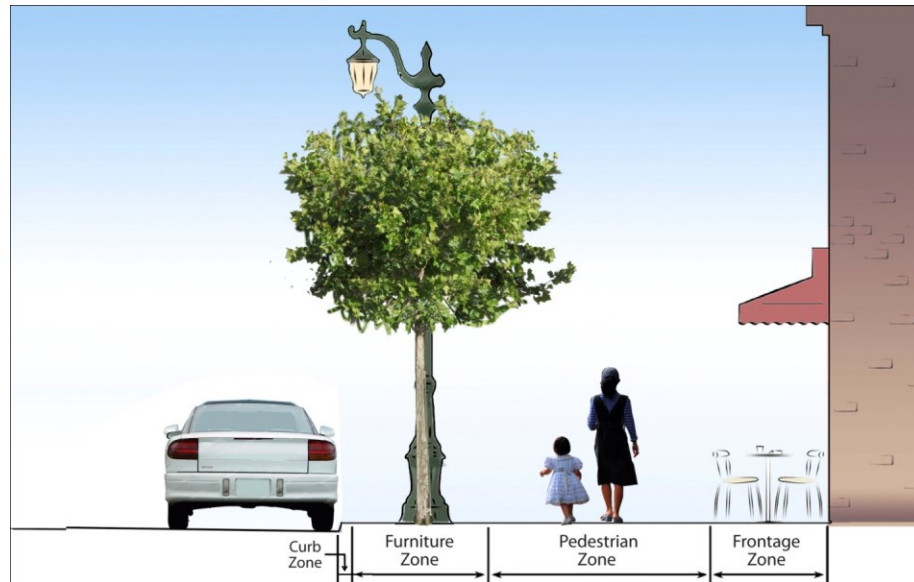


INDUSTRIAL

Industrial streets are zoned for manufacturing, office warehousing, and distribution. Pedestrian volumes are likely to be lower here given that these land uses typically employ fewer people per square foot than general commercial areas. Employees will need good sidewalks to get to work.

DOWNTOWN CORE/MAIN STREET

The downtown core or Main Street is a pedestrian-oriented area. This is where the greatest numbers of pedestrians are encouraged and expected. The downtown core serves as the retail, restaurant, and entertainment center of a community. This area will need the widest sidewalks, the widest crosswalks, the brightest street lighting, the most furnishings, and other features that will enhance the pedestrian environment. Of the four sidewalk zones, the pedestrian and frontage zones will be favored, with a furniture zone wide enough for street trees.

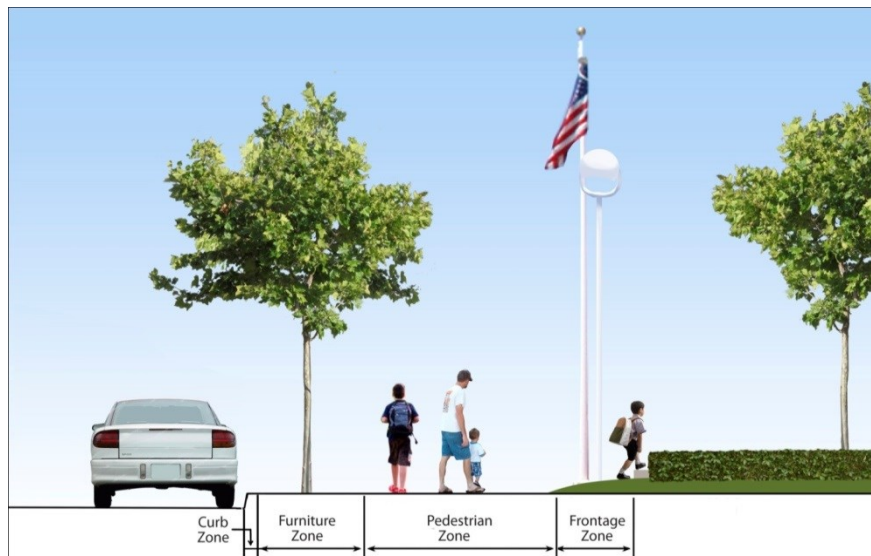


OFFICE PARK

These streets are home to national and regional offices of financial institutions, government, large companies, and other uses. Cities can expect pedestrians during the morning and evening commutes walking to and from their cars. Visitors will use the sidewalks throughout the day and employees will need them during the lunch hour. The furniture zone should provide adequate buffer from parking lots.

PUBLIC FACILITIES

Streets adjacent to public facilities, particularly streets near schools, libraries, and civic centers, require special attention and treatment. High pedestrian volumes are expected during peak times, such as school pick-up and drop-off, and during the morning and evening commute hours. Sidewalk design should accommodate these peak travel times and include adequate furniture zones to buffer pedestrians from the street. Public



facilities are located in various types of streets ranging from local streets to arterials with transit service.

DESIGN SPECIFICATIONS BY ROADWAY TYPE AND LAND USE

Table 5.2 lists minimum widths for the frontage, pedestrian, furniture, and curb zones, as well as for the recommended minimum total widths. These minimums should not be considered the design width; in many cases, wider zones will be needed.

Table 5.2 Pedestrian Route Design Specifications by Roadway Type and Use

Use	Arterial			Minor Arterial			Collector			Local		
	Element	Min Width	Preferred Width	Element	Min Width	Preferred Width	Element	Min Width	Preferred Width	Element	Min Width	Preferred Width
Typical Route	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"
	Furniture	1'	5'	Furniture	1'	7'	Furniture	1'	7'	Furniture	1'	7'
	Pedestrian	5'	5'	Pedestrian	5'	5'	Pedestrian	4'	4'	Pedestrian	4'	4'
	Frontage	1'	4'	Frontage	1'	2'	Frontage	1'	2'	Frontage	0'	1'
	Total	7'-8"	14'-8"	Total	7'-8"	14'-8"	Total	6'-8"	13'-8"	Total	5'-8"	12'-8"
Downtown/ Campus Corner	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"
	Furniture	2'	5'	Furniture	2'	5'	Furniture	1'	5'	Furniture	1'	6'
	Pedestrian	5'	6'	Pedestrian	5'	6'	Pedestrian	4'	5'	Pedestrian	4'	5'
	Frontage	2'	8'	Frontage	2'	5'	Frontage	2'	3'	Frontage	1'	1'
	Total	9'-8"	19'-8"	Total	9'-8"	16'-8"	Total	7'-8"	13'-8"	Total	6'-8"	12'-8"
Commercial District	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"
	Furniture	1'	5'	Furniture	1'	6'	Furniture	1'	5'	Furniture	1'	7'
	Pedestrian	5'	5'	Pedestrian	5'	5'	Pedestrian	4'	4'	Pedestrian	4'	4'
	Frontage	1'	5'	Frontage	1'	1'	Frontage	2'	4'	Frontage	0'	1'
	Total	7'-8"	15'-8"	Total	7'-8"	12'-8"	Total	7'-8"	13'-8"	Total	5'-8"	12'-8"
Trails	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"	Curb	8"	8"
	Furniture	1'	7'	Furniture	1'	6'	Furniture	1'	2'	Furniture	1'	3'
	Pedestrian	10'	10'	Pedestrian	10'	10'	Pedestrian	8'	10'	Pedestrian	5'	8'
	Frontage	1'	8'	Frontage	1'	1'	Frontage	1'	2'	Frontage	1'	1'
	Total	12'-8"	25'-8"	Total	12'-8"	17'-8"	Total	10'-8"	13'-8"	Total	7'-8"	12'-8"

GENERAL GUIDELINES

The land uses included in the previous table cover those of most municipalities. For those few areas not covered, the following list provides general guidelines for sidewalks:

- The recommended minimum frontage zone width is 18 inches.
- The recommended minimum pedestrian zone width is 4 feet.
- The recommended minimum curb zone width is 6 inches or 18 inches where pedestrian or freight loading is expected and may conflict with obstacles in the furniture zone.
- The recommended minimum furniture zone width is 4 feet and 6 feet to 8 feet where bus stops exist.
- Low curbs (3 to 4 inches high) reduce the division between the traveled way and the sidewalk. They are favored in areas with significant pedestrian traffic. Low curbs also

improve the geometry and feasibility of providing two perpendicular curb ramps per corner.

Some judgment may be needed on a case-by-case basis to establish actual widths of each of the four zones.

FOR MORE INFORMATION

- ADAAG/PROWAG
- MUTCD
- AASHTO “Green Book”
- FHWA’s Designing Sidewalks and Trails for Access
- NCHRP Project 20-7 (232) ADA Transition Plans: Guide to Best Management Practices
- NCHRP Project 3-62, Guidelines for Accessible Pedestrian Signals
- City of Norman Engineering Design Criteria
- City of Norman Comprehensive Transportation Plan

6. PEDESTRIAN CROSSINGS

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INTRODUCTION

Walking requires two important features in the built environment: people must walk along streets and they must get across streets. Crossing a street should be easy, safe, convenient, and comfortable. While pedestrian behavior and intersection or crossing design affect the street crossing experience, motorist behavior (whether and how motorists stop for pedestrians) is the most significant factor in pedestrian safety.



Crossings are a necessary part of the pedestrian experience (Credit: David Riesland)

A number of tools exist to improve pedestrian safety and to make crossing streets easier. Effective traffic management can address concerns about traffic speed and volume. A motorist driving more slowly has more time to see, react, and stop for a pedestrian. The number of pedestrians also influences motorists; in general, motorists are more aware of pedestrians when more people walk. Most tools to address crossing challenges are engineering treatments, but tools from the enforcement, education, and planning toolboxes are also important.

Providing marked crosswalks is only one of the many possible engineering measures. When considering how to provide safer crossings for pedestrians, the question should *not* be: "Should I provide a marked crosswalk?" Instead, the question should be: "What are the most effective measures that can be used to help pedestrians safely cross the street?" Deciding whether to mark or not mark crosswalks is only one consideration in creating safe and convenient pedestrian crossings.

This chapter describes a number of measures to improve pedestrian crossings, including marked and unmarked crosswalks, raised crossing islands and medians, and lighting.

ESSENTIAL PRINCIPLES OF PEDESTRIAN CROSSINGS

The following principles should be incorporated into every pedestrian crossing improvement:

- Pedestrians must be able to cross roads safely. Cities have an obligation to provide safe and convenient crossing opportunities.
- The safety of all street users, particularly more vulnerable groups, such as children, the elderly, and those with disabilities, and more vulnerable modes, such as walking and bicycling, must be considered when designing streets.
- Pedestrian crossings must meet accessibility standards and guidelines.



Curb extensions and median make crossing four-lane streets safer and more manageable. (Credit: Dan Burden)

- Real and perceived safety must be considered when designing crosswalks—crossing must be “comfortable.” A “safe” crossing that no one uses serves no purpose.
- Crossing treatments that have the highest crash reduction factors (CRFs) should be used when designing crossings.
- Safety should not be compromised to accommodate traffic flow.
- Every crossing is different and should be selected and designed to fit its unique environment.

The following issues should also be considered when planning and designing crossings:

- Ideally, uncontrolled crossing distances should be no more than 21 feet, which allows for one 11-foot lane and one 10-foot lane. Ideally, streets wider than 40 feet should be divided (effectively creating two streets) by installing a median or two crossing islands.
- The number of lanes should be limited to a maximum of three lanes per direction on all roads (plus a median or center turn lane).
- There must be a safe, convenient crossing at every transit stop.
- The use of concurrent movements (vehicular and pedestrian) should be limited to those situations where the conditions dictate such.
- People should never have to wait more than 90 seconds to cross at signalized intersections.
- Pedestrian signals should be provided at all signalized crossings where pedestrians are allowed.

PERFORMANCE MEASURES

Performance measures establish how well a crossing is performing. In all cases, baseline data should be collected to allow for before and after analysis. Performance measures for pedestrian crossings include the following:

- The number of pedestrians crossing at a particular crossing location goes up.
- The pedestrian crash rates go down (for an accurate determination, entire corridors should be analyzed since crashes at any one location may be infrequent).
- Pedestrian fatalities and serious injuries should decrease.
- The numbers of children, seniors, and people with disabilities crossing the street should reflect their percentage in the larger population.
- The speed of motorists either turning at an intersection or traveling at a mid-block crossing goes down.
- Motorists do not block intersections (including crosswalks).
- At uncontrolled intersections, the percentage of motorists who stop for pedestrians goes up (measure compliance with stop or yield requirement in local vehicle code).



Lively streets with many pedestrians indicate a walkable neighborhood: Hong Kong (Credit: Ryan Snyder)

PEDESTRIAN CROSSING TOOLBOX

Many engineering measures may be used at a pedestrian crossing, depending on site conditions and potential users. Marked crosswalks are commonly used at intersections and sometimes at mid-block locations. Marked crosswalks are often the first measure in the toolbox followed by a series of other measures that are used to enhance and improve marked crosswalks. The decision to mark a crosswalk should not be considered in isolation, but rather in conjunction with other measures to increase awareness of pedestrians. Without additional measures, marked crosswalks alone may not increase pedestrian safety, particularly on multi-lane streets.

MARKED CROSSWALKS

Crosswalks are present by law at all intersections, whether marked or unmarked, unless the pedestrian crossing is specifically prohibited. At mid-block locations, crosswalks only exist where marked. At these non-intersection locations, the crosswalk markings legally establish the crosswalk. Crosswalks should be considered at mid-block locations where there is strong evidence that pedestrians want to cross there, due to origins and destinations across from each other and an overly long walking distance to the nearest controlled crossing. Marked crosswalks alert drivers to expect crossing pedestrians and direct pedestrians to desirable crossing locations. Although many motorists are unaware of their precise legal obligations at crosswalks, the Oklahoma Vehicle Code requires drivers to yield to pedestrians in any crosswalk, whether marked or unmarked. Marking crosswalks at every intersection is not necessary or desirable.

Crosswalk Markings

According to the MUTCD, the minimum crosswalk marking shall consist of solid white lines. They shall not be less than 6 inches or greater than 24 inches in width.

Placement

The best locations to install marked crosswalks are:

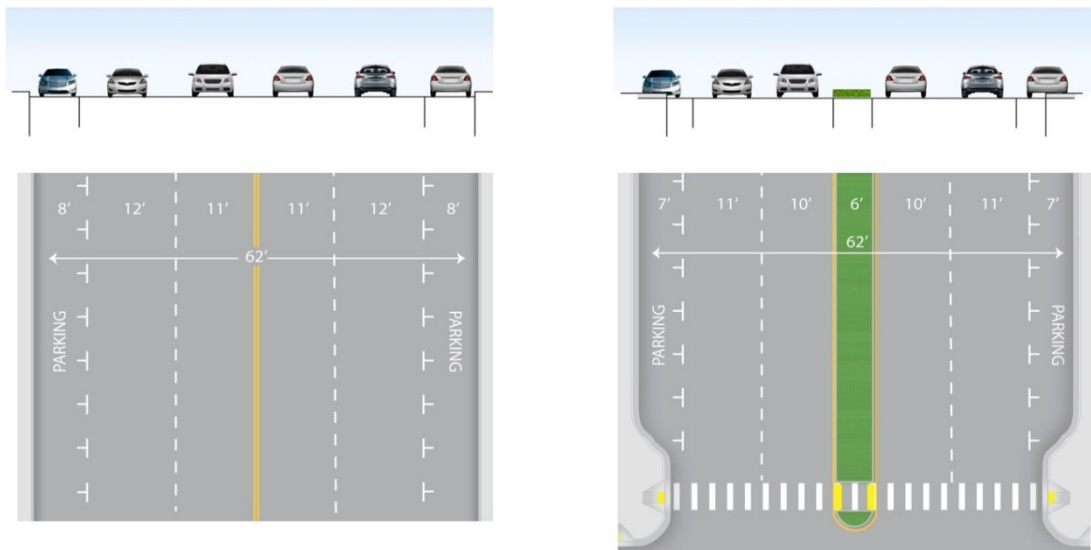
- All signalized intersections
- Crossings near transit locations
- Trail crossings
- High land use generators
- School walking routes
- When there is a preferred crossing location due to sight distance
- Where needed to enable comfortable crossings of multi-lane streets between controlled crossings spaced at convenient distances

Controlled Intersections

Intersections can be controlled by traffic signals or STOP signs. Marked crosswalks should be provided on all intersection legs controlled by traffic signals, unless the pedestrian crossing is specifically prohibited. Marked crosswalks may be considered at STOP-controlled intersections. Factors to be considered include high pedestrian volumes, high vehicle volumes, school zone location, high volume of elderly or disabled users, or other safety related criteria.

Uncontrolled Intersections and Mid-block Crosswalks

Intersections without traffic signals or STOP signs are considered uncontrolled intersections. The decision to mark a crosswalk at an uncontrolled location should be guided by an engineering study. Factors considered in the study should include, but not necessarily be limited to, vehicular volumes and speeds, stopping sight distance and triangles, distance to the next controlled crossing, night time visibility, grade, and pedestrian volumes. The engineering study should be based on the FHWA study, *Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations*. The following list provides some of the key recommendations from the study:



Uncontrolled crossings of four-lane streets can be difficult to cross without special treatments like medians and curb extensions.
(Credit: Michele Weisbart)

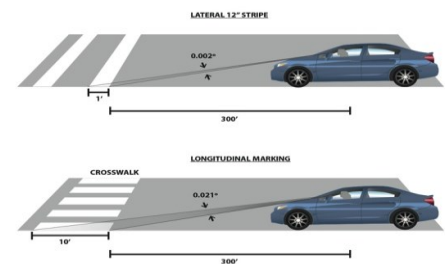
- It is permissible to mark crosswalks on two-lane roadways.
- On multi-lane roadways, marked crosswalks *alone* are not recommended under the following conditions (the other tools listed in this section can be considered to enhance the crosswalk):
 - ADT > 15,000
 - Speeds greater than 40 mph
- Raised medians can be used to reduce risk.
- Signals or other treatments should be considered where there are many young and/or elderly pedestrians.

Frequency of Marked Crosswalks at Uncontrolled Locations

Marked crosswalks should be spaced so people can cross at preferred locations. If people are routinely crossing streets at non-preferred locations, consideration should be given to installing a new crossing. Pedestrians need crossings with appropriate devices (islands, curb extensions, advanced yield lines, etc.) of multi-lane streets where there are strong desire lines. Along urban streets, a well-designed crossing should be provided at least every 1/8 mile.

High-Visibility Crosswalks

Because of the low approach angle at which pavement markings are viewed by drivers, the use of longitudinal stripes in addition to or in place of transverse markings can significantly increase the visibility of a crosswalk to oncoming traffic. While research has not shown a direct link between increased crosswalk visibility and increased pedestrian safety, high-visibility crosswalks have been shown to increase motorist yielding and channelization of pedestrians, leading the Federal Highway Administration to conclude that high-visibility pedestrian crosswalks have a positive effect on pedestrian and driver behavior.



*Longitudinal crosswalk markings are more visible than lateral crosswalk markings
(Credit: Michele Weisbart)*

Colored and stamped crosswalks should only be used at controlled locations.

Staggered longitudinal markings reduce maintenance since they avoid vehicle wheel paths.



*Typical crosswalk markings: Continental, Ladder, and Staggered Continental
(Credit: Michele Weisbart)*

*At Left: Example of staggered continental crosswalk
(Credit: Michael Ronkin)*

Crosswalks and Accessibility



*Decorative crosswalk treatments made of distinctive materials can become uneven over time.
(Credit: Ryan Snyder)*

The Pedestrian Access Route continues through the crosswalk and must conform to the surface condition, width, and slope requirements discussed in Chapter 5, “Universal Pedestrian Access.”

Longitudinal crosswalk markings provide the best visibility for pedestrians with limited vision.

Decorative crosswalk pavement materials should be chosen with care to ensure that smooth surface conditions and high contrast with surrounding pavement are provided. Textured materials within the crosswalk are not recommended. Without reflective materials, these treatments are not visible

to drivers at night. Decorative pavement materials often deteriorate over time and become a maintenance problem while creating uneven pavement. The use of color or material to delineate the crosswalks as a replacement of retro-reflective pavement marking should not be used, except in slow speed districts where intersecting streets are designed for speeds of 20 mph or less.

RAISED CROSSING ISLANDS/MEDIANS

Raised islands and medians are the most important, safest, and most adaptable engineering tool for improving street crossings. *Note on terminology: a median is a continuous raised area separating opposite flows of traffic. A crossing island is shorter and located just where a pedestrian crossing is needed.* Raised medians and crossing islands are commonly used between intersections when blocks are long (500 feet or more in downtowns) and in the following situations:

- Speeds are higher than desired
- Streets are wide
- Traffic volumes are high
- Sight distances are poor

Raised islands have nearly universal applications and should be placed where there is a need for people to cross the street. They are also used to slow traffic.



*Staggered median crossing
(Credit: Marcel Schmaedick)*



*Medians and crossing islands allow pedestrians to complete the crossing in two stages.
(Credit: Michele Weisbart)*

Reasons for Efficacy

Their use changes a complex task, crossing a wide street with traffic coming from two opposing directions all at once, into two simpler and smaller tasks. With their use, conflicts occur in only one direction at a time, and exposure time can be reduced from more than 20 seconds to just a few seconds.

On multi-lane streets with traffic speeds higher than 30 mph, it may be unsafe to cross without a median island. At 30 mph, motorists travel 44 feet each second, placing them 880 feet out when a pedestrian starts crossing an 80-foot wide multi-lane road. In this situation, this pedestrian may still be in the last travel lane when the car arrives there; that car was not within view at the time he or she started crossing. With an island on multi-lane roadways, people would cross two or three lanes at a time instead of four or six. Having to wait for a gap in only one direction of travel at a time significantly reduces the wait time to cross. Medians and crossing islands have been shown to reduce crashes by 40 percent (Federal Highway Administration, Designing for Pedestrian Safety course).

As a general rule, crossing islands are preferable to signal-controlled crossings due to their lower installation and maintenance cost, reduced waiting times, and their safety benefits. Crossing islands are also used with road diets, taking four-lane undivided, high-speed roads down to better performing three-lane roadways (two travel lanes and a center turn lane); portions of the center turn lane can be dedicated to crossing islands. Crossing islands can also be used with signals.

Angled pedestrian crossings through pedestrian refuges (as shown in the adjacent photo) force pedestrians to look for oncoming vehicles.



*Angled median crossing
(Credit: Paul Zykořsky)*



*Multiple tools can be employed to improve
uncontrolled crossings.
(Credit: Dan Burden)*

Where to Place Crossing Islands

Crossing islands are often used for trails, high pedestrian flow zones, transit stations, schools, work centers, and shopping districts.

Design Detail

Crossing islands, like most traffic calming features, perform best with both tall trees and low ground cover. This greatly increases their visibility, reduces surprise, and lowers the need for a plethora of signs. When curves or hill crests complicate crossing locations, median islands are often extended over a crest or around a curve to where motorists have a clear (six second or longer) sight line of the downstream change in conditions. Lighting of median islands is essential. The suggested minimum width of a crossing island is 6 feet. When used on higher speed roads, and where there is space available, inserting a 45-degree bend to the right helps orient pedestrians to the risk they encounter from motorists during the second half of their crossing.



*Crossing islands: Berkeley, CA
(Credit: Ryan Snyder)*

RAISED CROSSWALKS



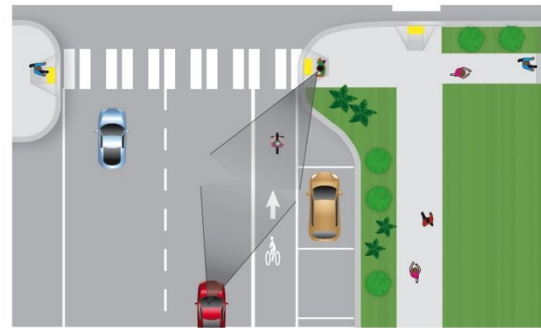
*Raised crosswalk: University of North
Carolina Campus, Chapel Hill, NC
(Credit: Ryan Snyder)*

Raised crosswalks slow traffic and put pedestrians in a more visible position. They are trapezoidal in shape on both sides and have a flat top where the pedestrians cross. The level crosswalk area must be paved with smooth materials; any texture or special pavements used for aesthetics should be placed on the beveled slopes, where they will be seen by approaching motorists. They are most appropriate in areas with significant pedestrian traffic and where motor vehicle traffic should move slowly, such as near schools, on college campuses, in Main Street retail environments, and in other similar places. They are especially effective near elementary schools where they raise small children by a few inches and make them more visible.

CURB EXTENSIONS

Curb extensions extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the time that pedestrians are in the street. Reducing street widths improves signal timing since pedestrians need less time to cross.

Motorists typically travel more slowly at intersections or mid-block locations with curb extensions, as the restricted street width sends a visual cue to slow down. Turning speeds are lower at intersections with curb extensions (curb radii should be as tight as is practicable). Curb extensions also prevent motorists from parking too close to the intersection.



*Curb extensions
(Credit: Michele Weisbart)*

Curb extensions also provide additional space for two curb ramps and for level sidewalks where existing space is limited, increase the pedestrian waiting space, and provide additional space for pedestrian push button poles, street furnishings, plantings, bike parking and other amenities. A benefit for drivers is that extensions allow for better placement of signs (e.g., STOP signs and signals).



(Credit: David Riesland)

Curb extensions are generally only appropriate where there is an on-street parking lane. Where street width permits, a gently tapered curb extension can reduce crossing distance at an intersection along streets without on-street parking, without creating a hazard. Curb extensions must not extend into travel lanes or bicycle lanes.

Curb extensions can impact other aspects of roadway design and operation as follows:

- May impact street drainage and require catch basin relocation
- May impact underground utilities
- May require loss of curbside parking, though careful planning often mitigates this potential loss, for example by relocating curbside fire hydrants, where no parking is allowed, to a curb extension
- May complicate delivery access and garbage removal
- May impact snow plows and street sweepers
- May affect the turning movements of larger vehicles such as school buses and large fire trucks

PEDESTRIAN 'SCRAMBLES'



*Pedestrian scramble
(Credit: Dan Burden)*

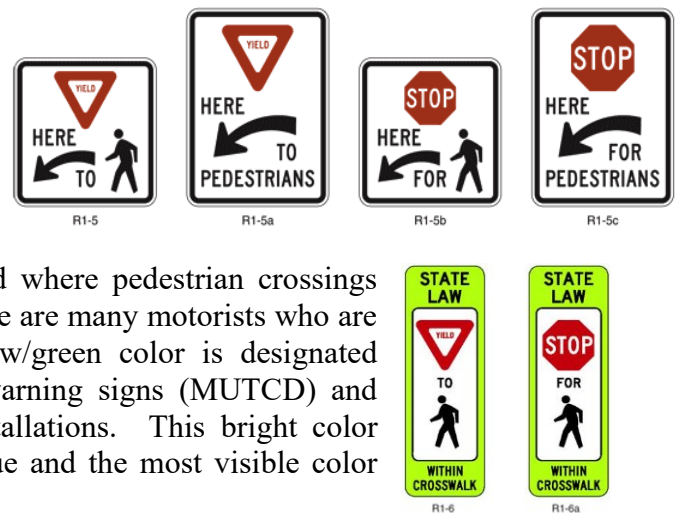
Exclusive pedestrian phases (i.e. pedestrian 'scrambles') may be used where turning vehicles conflict with very high pedestrian volumes and pedestrian crossing distances are short. Although pedestrians can cross in any direction during the pedestrian phase, pedestrians typically have to wait for both vehicle phases before they get the walk signal again. This creates delay for pedestrians travelling straight, but can be mitigated by allowing pedestrians continuing along the same direction to get a WALK signal during the green signal phase and while turns are prohibited for traffic.

SIGNS



Signs can provide important information to improve road safety by letting people know what to expect, so they can react and behave appropriately. Sign use and placement should be done judiciously, as overuse breeds noncompliance and disrespect. Too many signs create visual clutter.

Regulatory signs, such as STOP, YIELD, or turn restrictions, require driver actions and can be enforced. Warning signs provide information, especially to motorists and pedestrians unfamiliar with an area.

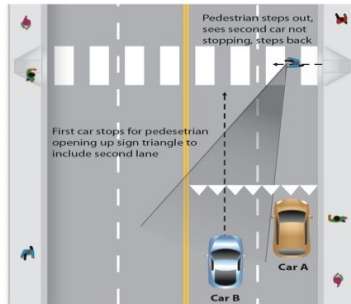


Advance pedestrian warning signs should be used where pedestrian crossings may not be expected by motorists, especially if there are many motorists who are unfamiliar with the area. The fluorescent yellow/green color is designated specifically for pedestrian, bicycle, and school warning signs (MUTCD) and should be used for all new and replacement installations. This bright color attracts the attention of drivers because it is unique and the most visible color during nighttime driving conditions.

Sign R1-5 should be used in conjunction with advance yield lines, as described below. Sign R1-6 may be used on median islands, where they will be more visible to motorists than signs placed on the side of the street, especially where there is on-street parking.

All signs should be periodically checked to make sure that they are in good condition, free from graffiti, reflective at night, and continue to serve a purpose. All sign installations need to comply with the provisions of the MUTCD.

ADVANCED YIELD/STOP LINES



*Advanced yield markings
(Credit: Michele Weisbart)*

Stop lines are solid white lines 12 to 24 inches wide, extending across all approach lanes to indicate where vehicles must stop in compliance with a STOP sign or signal. Advance stop lines reduce vehicle encroachment into the crosswalk and improve drivers' view of pedestrians.

At signalized intersections a stop line is

typically set back between 4 and 6 feet.

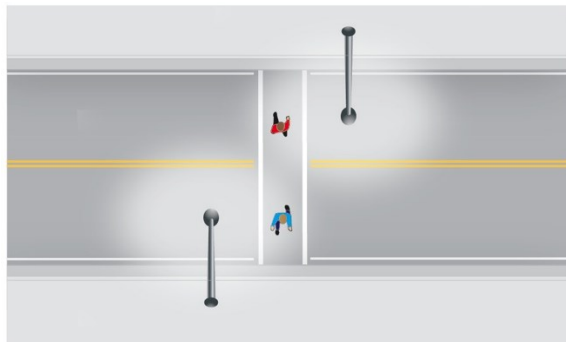
At uncontrolled crossings of multi-lane roads, advance yield lines can be an effective tool for preventing multiple threat vehicle and pedestrian collisions. Section 3B.16 of the MUTCD specifies placing advanced yield markings 20 to 50 feet in advance of crosswalks, depending upon location-specific variables such as vehicle speeds, traffic control, street width, on-street parking, potential for visual confusion, nearby land uses with vulnerable populations, and demand for queuing space. Thirty feet is the preferred setback for effectiveness at many locations. This setback allows a pedestrian to see if a car in the second (or third) lane is stopping after a driver in the first lane has stopped.



*Advanced yield markings
(Credit: Sky Yim)*

LIGHTING

Lighting is important to include at all pedestrian crossing locations for the comfort and safety of the road users. Lighting should be present at all marked crossing locations. Lighting provides cues to drivers to expect pedestrians earlier.



*Proper placement of crosswalk illumination
(Credit: Michele Weisbart)*

FHWA HT-08-053, *The Information Report on Lighting Design for Mid-block Crosswalks*, found that a vertical illumination of 20 lux in front of the crosswalk, measured at a height of 5 feet from the road surface, provided adequate detection distances in most circumstances. Although the research was constrained to mid-block placements of crosswalks, the report includes a brief discussion of considerations in lighting crosswalks

co-located with intersections which also applies at intersections. Illumination just in front of crosswalks creates the best pedestrian visibility.

More guidance on crosswalk lighting levels comes from the Illuminating Engineering Society of North America (IESNA) intersection guidance to illuminate pedestrians in the crosswalk to vehicles (see the adjacent image). Crosswalk lighting should provide color contrast from standard roadway lighting.

Table 7.1 Recommended Illumination by Street Type

Functional Classification	Average Maintained Illumination at Pavement by Pedestrian Area Classification [FC]		
	High	Medium	Low
Major / Major (arterial/arterial)	3.4 fc	2.6 fc	1.8 fc
Major / Collector (arterial/collector)	2.9 fc	2.2 fc	1.5 fc
Major / Local (arterial/local)	2.6 fc	2.0 fc	1.3 fc
Collector / Collector (collector/collector)	2.4 fc	1.8 fc	1.2 fc
Collector / Local (collector/local)	2.1 fc	1.6 fc	1.0 fc
Local / Local (local/local)	1.8 fc	1.4 fc	0.8 fc

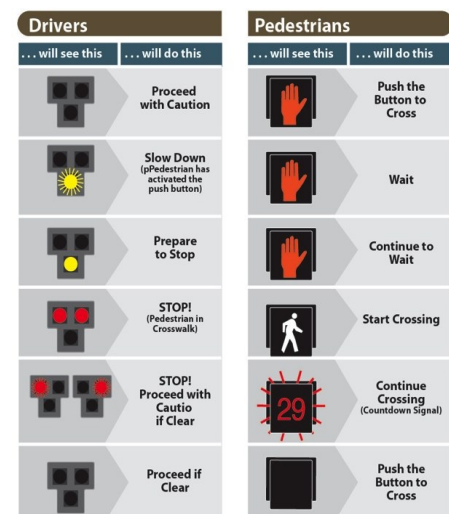
FC stands for "foot candle" and is defined as the amount of illuminance on a 1 square foot surface of which there is uniformly distributed flux of one lumen. ANSI-IESNA RP-8-00, "Roadway Lighting," P. 15

PEDESTRIAN HYBRID BEACON

A pedestrian hybrid beacon is used to warn and control traffic at an unsignalized location so as to help pedestrians cross a street or highway at a marked crosswalk.

A pedestrian hybrid beacon can be used at a location that does not meet traffic signal warrants or at a location that meets traffic signal warrants but a decision has been made to not install a traffic control signal. A minimum number of 20 pedestrians per hour is needed to warrant installation. This is substantially less than the 93 minimum needed for a signal installation.

If beacons are used, they should be placed in conjunction with signs, crosswalks, and advanced yield lines to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon should only be installed at a marked crosswalk. Installations should be done in accordance with the MUTCD.



*Pedestrian hybrid beacon phases
(Credit: Michele Weisbart)*

Rectangular Rapid Flash Beacon (RRFB)

The RRFB uses rectangular-shaped high-intensity LED-based indications, flashes rapidly in a wig-wag "flickering" flash pattern, and is mounted immediately between the crossing sign and the sign's supplemental arrow plaque.



Rectangular Rapid-Flash Beacon in Norman, OK (Credit: David Riesland)

FHWA Evaluation of Results

The Office of Transportation Operations has reviewed available data and considers the RRFB to be highly successful for the applications tested (uncontrolled crosswalks). The RRFB offers significant potential safety and cost benefits because it achieves very high rates of compliance at a very low cost compared to other more restrictive devices such as full mid-block signalization. The components of the RRFB are not proprietary and can be assembled by any jurisdiction with off-the-shelf hardware. The FHWA believes that the RRFB has a low risk of safety or operational concerns. However, because proliferation of RRFBs in the roadway environment to the point that they become ubiquitous could decrease their effectiveness, use of RRFBs should be limited to locations with the most critical safety concerns, such as pedestrian and school crosswalks at uncontrolled locations, as tested in the experimentation.

At a recent meeting of the National Committee on Uniform Traffic Control Devices, the Signals Technical Committee voted to endorse the future inclusion of the RRFB for uncontrolled crosswalks into the MUTCD and recommended that FHWA issue an Interim Approval for RRFB. This Interim Approval allows agencies to install this type of flashing beacon, pending official MUTCD rulemaking.

PEDESTRIAN TOOLBOX FOR RAILROAD CROSSINGS

Pedestrian crossings of railroad tracks apply a special set of tools. The following are the primary tools to apply:

- Pedestrian gates
- Channelization of pedestrians through gates and across tracks
- Warning flashers
- Signs
- Audible signals

7. BIKEWAY DESIGN

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ESSENTIAL PRINCIPLES OF BIKEWAY DESIGN

The following principles inform the recommendations made in this chapter:

- Bicyclists should have safe, convenient, and comfortable access to all destinations.
- Every street is a bicycle street, regardless of bikeway designation.
- Street design should accommodate all types, levels, and ages of bicyclists.
- Bicyclists should be separated from pedestrians.
- Bikeway facilities should take into account vehicle speeds and volumes, with
 - Shared use on low volume, low-speed roads.
 - Separation on higher volume, higher-speeds roads.
- Bikeway treatments should provide clear guidance to enhance safety for all users.
- Since most bicycle trips are short, a complete network of designated bikeways has a grid of roughly ½ mile.

PLANNING FOR A RANGE OF BIKEWAY USERS



*Plan bicycle facilities for various skill levels
(Credit: Dan Burden)*

Many early bikeway designs assumed that bicyclists resemble pedestrians in their behavior. This led to undesirable situations: bicyclists being under-served by inadequate facilities, pedestrians resenting bicyclists in their space, and motorists being confused by bicyclists entering and leaving the traffic stream in unpredictable ways. Only under special circumstances (e.g., on shared-use paths or shared-space streets) should bicyclists and pedestrians share the same space.

Bicyclists operate a vehicle and are legitimate road users, but they are slower and less visible than motor vehicles. Bicyclists are also more vulnerable in a crash than motorists. They need accommodation on busy, high-speed roads and at complex intersections. In congested urban areas, bicyclists provided with well-designed facilities can often proceed faster than motorists.

Bicyclists use their own power, must constantly maintain their balance, and don't like to interrupt their momentum. Typical bicyclist speeds range from 10 to 15 mph, enabling them to make trips of up to 5 miles in urban areas in about 25 minutes, the equivalent of a typical suburban commuter trip time. Bicyclists may wish to ride side-by-side so they can interact socially with a riding companion.

Well-designed bicycle facilities guide cyclists to ride in a manner that generally conforms to the vehicle code: in the same direction as traffic and usually in a position 3 to 4 feet from the right edge of the traveled way or parked cars to avoid debris, drainage grates, and other potential hazards. Cyclists should be able to proceed through intersections in a direct, predictable, and safe manner.

Cyclist skill level also provides a wide variety of speeds and expected behaviors. Several systems of bicyclist classification are used within the bicycle planning and engineering professions. These classifications can be helpful in understanding the characteristics and infrastructure preferences of different cyclists. However, these classifications may change in type or proportion over time as infrastructure and culture evolve. Bicycle infrastructure should use planning and designing options, from shared roadways to separate facilities, to accommodate as many user types as possible and to provide a comfortable experience for the greatest number of cyclists.

A classification system developed by the City of Norman provides the following bicycle user types:

- **Advanced Riders.** These bicyclists are on streets with high volumes of automobile traffic. These tend to be very experienced riders who are comfortable in most any traffic conditions.
- **Casual or Younger Riders.** This group prefers to bicycle on streets with low to moderate traffic volumes and lower speeds. These more casual and younger riders are less confident in traffic without special provisions for bicycles.
- **Young Riders Monitored by Parents.** This group is most comfortable riding separate from vehicular traffic. These riders are most likely to be found on bike paths that may or may not be shared with pedestrians. This type of facility can be good for all riders but is particularly good for young riders who still must be monitored in their riding.



*Proficient bicycle rider
(Credit: Dan Burden)*



*Less-experienced riders prefer paths (Credit:
Dan Burden)*

BIKEWAY TYPES

A designated bikeway network provides a system of facilities that offers enhancement or priority to bicyclists over other roadways in the network. However, it is important to remember that all streets in a city should safely and comfortably accommodate bicyclists, regardless of whether the street is designated as a bikeway. Several general types of bikeways are listed below with no implied order of preference.

SHARED ROUTES



Bicycle Route
(Credit: Marty Bruinsma)

even many low-volume highways.

A shared route is a street in which bicyclists ride in the same travel lanes as other traffic. There are no specific dimensions for shared routes. On narrow travel lanes, motorists have to cross over into the adjacent travel lane to pass a cyclist.

Shared routes work well and are common on low-volume, low-speed neighborhood residential streets, rural roads, and

BICYCLE BOULEVARDS



Bicycle boulevard: Portland, OR
(Credit: Ryan Snyder)

A bicycle boulevard is a street that has been modified to prioritize through bicycle traffic but discourage through motor vehicle traffic. Traffic calming devices control traffic speeds and discourage through trips by automobiles. Traffic controls limit conflicts between automobiles and bicyclists and give priority to through bicycle movement at intersections.

SHOULDER BIKEWAYS

This facility accommodates bicycle travel on rural highways and country roads by providing a suitable area for bicycling and reducing conflicts with faster moving motor vehicles.

BIKE LANES



Bike Lane in Norman, OK
(Credit: Angelo Lombardo)

Portions of the traveled way designated with striping, stencils, and signs for preferential use by bicyclists, bike lanes are appropriate on avenues and boulevards. They may be used on other streets where bicycle travel and demand is substantial. Where on-street parking is provided, bike lanes are striped on the left side of the parking lane.

CYCLE TRACKS

Cycle tracks are specially designed bikeways separated from the parallel motor vehicle travelway by a line of parked cars, landscaping, or a physical buffer that motor vehicles cannot cross. Cycle tracks are effective in attracting users who are concerned about conflicts with motorized traffic.

SHARED USE PATHS



*Shared-use path
(Credit: Marty Bruinsma)*

Shared use paths are facilities separated from motor vehicle traffic by an open space or barrier, either within the highway right-of-way or within an independent right-of-way.

Bicyclists, pedestrians, joggers, and skaters often use these paths. Shared-use paths are appropriate in areas not well served by the street system, such as

in long, relatively uninterrupted corridors like waterways, utility corridors, and rail lines. They are often elements of a community trail plan. Shared use paths may also be integrated into the street network with new subdivisions as described in Chapter 2, “Street Networks and Classifications.”



BIKE ROUTES

A term used for planning purposes or to designate recommended bicycle touring routes, a bike route can be any bikeway type.

INTEGRATING WITH THE STREET SYSTEM

Most bikeways are part of the street; therefore, well-connected street systems are very conducive to bicycling, especially those with a fine-meshed network of low-volume, low-speed streets suitable for shared roadways. In less well-connected street systems, where wide streets carry the bulk of traffic, bicyclists need supplementary facilities, such as short sections of paths and bridges, to connect otherwise unconnected streets.

There are no hard and fast rules for when a specific type of bikeway should be used, but some general principles guide selection. As a general rule, as traffic volumes and speeds increase, greater separation from motor vehicle traffic is desirable. For example, a bike route may be acceptable for speeds up to 30 mph and ADTs of up to 5,400. Separate bike lanes will accommodate users on streets up to 40 mph and ADTs of up to 22,000. Other factors to consider are users (more children or recreational cyclists may warrant greater separation), adjacent land uses (multiple driveways may cause conflicts with shared-use paths), available right-of-way (separated facilities require greater width), and costs.

As a general rule, designated bicycle facilities (e.g., bike lanes and cycle tracks) should be provided on all major streets (avenues and boulevards), as these roads generally offer the greatest level of directness and connectivity in the network, and are typically where destinations are located. There are occasions when it is infeasible or impractical to provide bikeways on a busy street, or the street does not serve the mobility and access needs of bicyclists. The following

guidelines should be used to determine if it is more appropriate to provide facilities on a parallel local street:

- Conditions exist such that it is not economically or environmentally feasible to provide adequate bicycle facilities on the street.
- The street does not provide adequate access to destination points within reasonable walking distances, or separated bikeways on the street would not be considered safe.
- The parallel route provides continuity and convenient access to destinations served by the street.
- Costs to improve the parallel route are no greater than costs to improve the street.
- If any of these factors are met, cyclists may actually prefer the parallel local street facility in that it may offer a higher level of comfort (bicycle boulevards are based on this approach).

Off-street paths can also be used to provide transportation in corridors otherwise not served by the street system, such as along rivers and canals, through parks, along utility corridors, on abandoned railroad tracks, or along active railroad rights-of-way. While paths offer the safety and scenic advantages of separation from traffic, they must also offer frequent connections to the street system and to destinations such as residential areas, employment sites, shopping, and schools. Street crossings must be well designed with measures such as signals or median refuge islands.

DESIGN OF EACH BIKEWAY TYPE

The following sections provide design guidance for each type of bikeway.

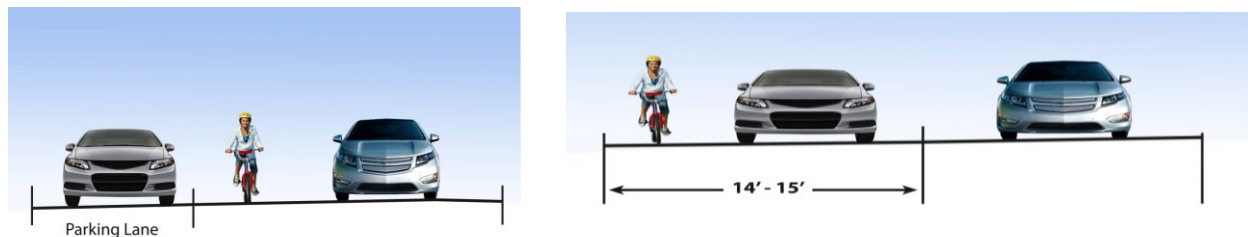
SHARED ROUTES

Shared routes are the most common bikeway type. There are no specific width standards for shared routes. Most are fairly narrow; they are simply the streets as constructed. Shared routes are suitable on streets with low motor vehicle speeds or traffic volumes, and on low-volume rural roads and highways. The suitability of a shared route decreases as motor vehicle traffic speeds and volumes increase, especially on rural roads with poor sight distance.

Many streets carry excessive traffic volumes at speeds higher than they were designed to carry. These can function better as shared routes if traffic speeds and volumes are reduced. For any street to function acceptably as a shared route, traffic volumes should not be more than 5,400 vehicles per day, and speeds should be 30 mph or less. If traffic speeds and volumes exceed those thresholds, separated facilities (e.g., bike lanes) should be considered or traffic calming should be applied to reduce the vehicle speeds/volumes. Many traffic-calming techniques can make these streets more amenable to bicycling.

Wide Curb Lanes

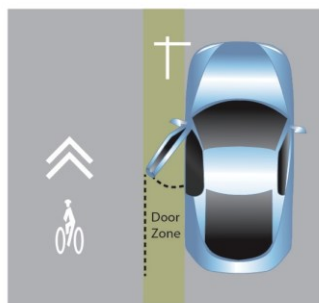
On streets where bike lanes would be more appropriate but with insufficient width for bike lanes, wide curb lanes may be provided. This may occur on retrofit projects where there are physical constraints and all other options, such as narrowing travel lanes, have been pursued. Wide curb lanes are not particularly attractive to most cyclists; they simply allow a passenger vehicle to pass cyclists within a travel lane, if cyclists are riding far enough to the right. Wide curb lanes may also encourage higher motor vehicle speeds and is contrary to the design principles of this manual; wide lanes should never be used on local residential streets. A 14 to 15-foot wide lane allows a passenger car to pass a cyclist in the same lane. Widths 16 feet or greater encourage the undesirable operation of two motor vehicles in one lane. In this situation, a bike lane should be striped.



Wide curb lane (Credit: Michele Weisbart)

Sharrows

Shared-lane marking stencils (“SLMs,” also commonly called “sharrows”) may be used as an additional treatment for shared roadways. The stencils can serve a number of purposes: they remind bicyclists to ride further from parked cars to prevent “dooring” collisions, they make motorists aware of bicycles potentially in the travel lane, and they show bicyclists the correct direction of travel. Sharrows installed next to parallel parking should be a minimum distance of 11 feet from the curb. Installing farther than 11 feet from the curb may be desired in areas with wider parking lanes or in situations where the sharrow is best situated in the center of the shared travel lane to promote cyclists taking the lane. Placing the sharrow between vehicle tire tracks increases the life of the markings and decreases long-term maintenance costs.



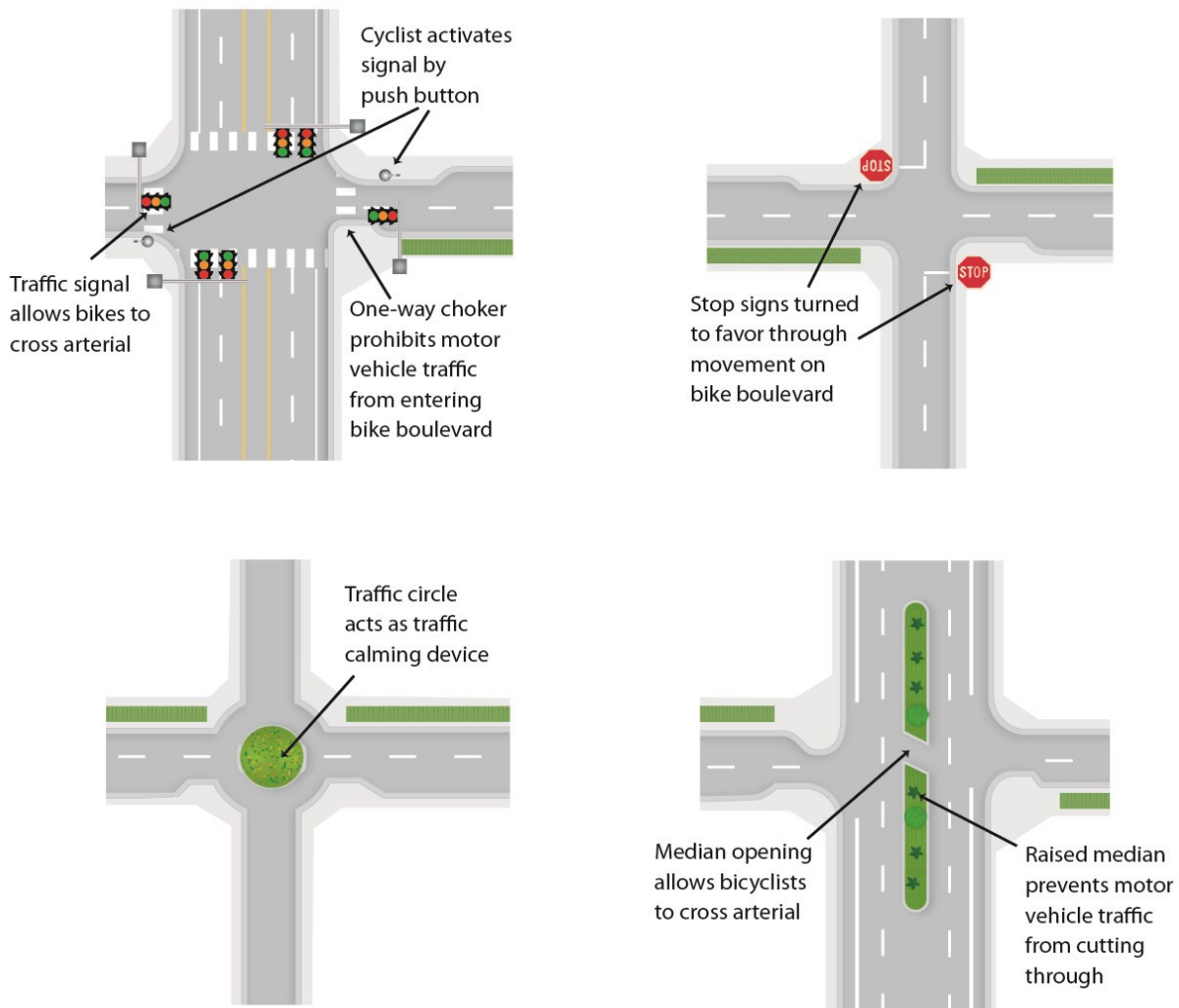
Sharrow
(Credit: Michele Weisbart)



Example of a Sharrow: Norman, OK
(Credit: CJ Whitaker)

BICYCLE BOULEVARDS

A bicycle boulevard is an enhanced shared roadway; a local street is modified to function as a prioritized through street for bicyclists while maintaining local access for automobiles. This is done by adding traffic-calming devices to reduce motor vehicle speeds and through trips, and installing traffic controls that limit conflicts between motorists and bicyclists and give priority to through bicyclist movement.



Components of bike boulevards (Credit: Michele Weisbart)

One key advantage of bicycle boulevards is that they attract cyclists who do not feel comfortable on busy streets and prefer to ride on lower traffic streets. Bicycle travel on local streets is generally compatible with local land uses (e.g., residential and some retail). Residents who want slower traffic on neighborhood streets often support measures that encourage bicycle boulevards. By reducing traffic and improving crossings, bicycle boulevards also improve conditions for

pedestrians. Successful bicycle boulevard implementation requires careful planning with residents and businesses to ensure acceptance.



Traffic circles allow for landscaping opportunities (Credit: Ryan Snyder)

Elements of a Bicycle Boulevard

A successful bike boulevard includes the following design elements:

- Selecting a direct and continuous street, rather than a circuitous route that winds through neighborhoods. Bike boulevards work best on a street grid. If any traffic diversion will likely result from the bike boulevard, selecting streets that have parallel higher-level streets can prevent unpopular diversion to other residential streets.
- Placing motor vehicle traffic diverters at key intersections to reduce through motor vehicle traffic (diverters are designed to allow through bicyclist movement).
- Turning STOP signs towards intersecting streets, so bicyclists can ride with few interruptions.
- Replacing STOP-controlled intersections with mini-circles and mini-roundabouts reduces the number of stops cyclists have to make,
- Placing traffic-calming devices lowers motor vehicle traffic speeds.
- Place wayfinding and other signs or markings to route cyclists to key destinations, to guide cyclists through difficult situations, and to alert motorists of the presence of bicyclists.

- Where the bike boulevard crosses high-speed or high-volume streets, providing crossing improvements such as:
 - Signals, where a traffic study has shown that a signal will be safe and effective. To ensure that bicyclists can activate the signal, loop detection should be installed in the pavement where bicyclists ride.
 - Roundabouts where appropriate.
 - Median refuges wide enough to provide a refuge (8 feet minimum) and with an opening wide enough to allow bicyclists to pass through (6 feet). The design should allow bicyclists to see the travel lanes they must cross.

SHOULDER BIKEWAYS

Paved shoulders are provided on rural highways for a variety of safety, operational, and maintenance reasons; they also provide a place for bicyclists to ride at their own pace, out of the stream of motorized traffic.

When providing shoulders for bicycle use, a minimum width of 6 feet is recommended. This allows a cyclist to ride far enough from the edge of pavement to avoid debris and far enough from passing vehicles to avoid conflicts. On roads with prevailing speeds over 45 mph, 8 feet is preferred. If there are physical width limitations, a minimum 4-foot shoulder may be used.

BIKE LANES

Bike lanes are a portion of the traveled way designated for preferential use by bicyclists; they are most suitable on avenues and boulevards. Bike lanes may also be provided on rural roads where there is high bicycle use. Bike lanes are generally not recommended on local streets with relatively low traffic volumes and speeds, where a shared roadway is the appropriate facility. There are no hard and fast mandates for providing bike lanes, but as a general rule, most jurisdictions consider bike lanes on roads with traffic volumes in excess of 5,400 ADT or traffic speeds of 30 mph or greater.

Bike lanes have the following advantages:

- They enable cyclists to ride at a constant speed, especially when traffic in the adjacent travel lanes speeds up or slows down (stop-and-go).
- They enable bicyclists to position themselves where they will be visible to motorists.
- They encourage cyclists to ride on the traveled way rather than the sidewalk.

Bike lanes are created with a solid stripe and stencils. Motorists are prohibited from using bike lanes for driving and parking, but may use them for emergency avoidance maneuvers or breakdowns. Bike lanes are one-way facilities that carry bicycle traffic in the same direction as adjacent motor-vehicle traffic. Bike lanes should always be provided on both sides of a two-way street. One exception is on hills where topographical constraints limit the width to a bike lane on one side only; the bike lane should be provided in the uphill direction as cyclists ride slower uphill, and they can ride in a shared lane in the downhill direction.

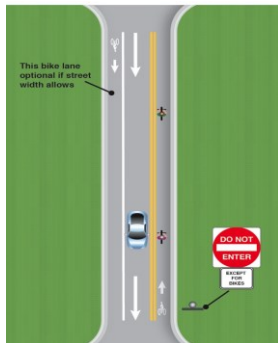
The minimum bike lane width is 5 feet from the face of a curb, or 4 feet on open shoulders. If on-street parking is permitted, the bike lane should be placed between parking and the travel lane with a preferred width of 6 feet so cyclists can ride outside the door zone. Streets with high volumes of traffic and/or higher speeds need wider bike lanes (6 feet to 8 feet) than those with less traffic or slow speeds. On curbed sections, a 4-foot (minimum 3 feet) wide smooth surface should be provided between the gutter pan and stripe. This minimum width enables cyclists to ride far enough from the curb to avoid debris and drainage grates and far enough from other vehicles to avoid conflicts. By riding away from the curb, cyclists are more visible to motorists than when hugging the curb. Where on-street parking is permitted, delineating the bike lane with two stripes, one on the street side and one on the parking side, is preferable to a single stripe.

Bike Lanes on Two-Way Streets

Basic bike lanes on two-way streets comprise the majority of bike lanes. They should follow the design guidelines for width with and without on-street parking.

Bike Lanes on One-Way Streets

Bike lanes on one-way streets should generally be on the right side of the traveled way and should always be provided on both legs of a one-way couplet. The bike lane may be placed on the left of a one-way street if it decreases the number of conflicts (e.g., those caused by heavy bus traffic or parking) and if cyclists can safely and conveniently transition in and out of the bike lane. If sufficient width exists, the bike lanes can be striped on both sides.



Contra-Flow Bike Lanes

Contra-flow bike lanes are provided to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping. Combining both directions of bicycle travel on one side of the street to accommodate contra-flow movement results in a two-way cycle track.

*Contra-flow bike lane design
(Credit: Michele Weisbart)*

Contra-flow bike lanes are useful where they provide a substantial savings in out-of-direction travel with direct access to high-use destinations, and safety is improved because of reduced conflicts compared to the longer route. The contra-flow design introduces new design challenges and may create additional conflict points as motorists may not expect on-coming bicyclists.

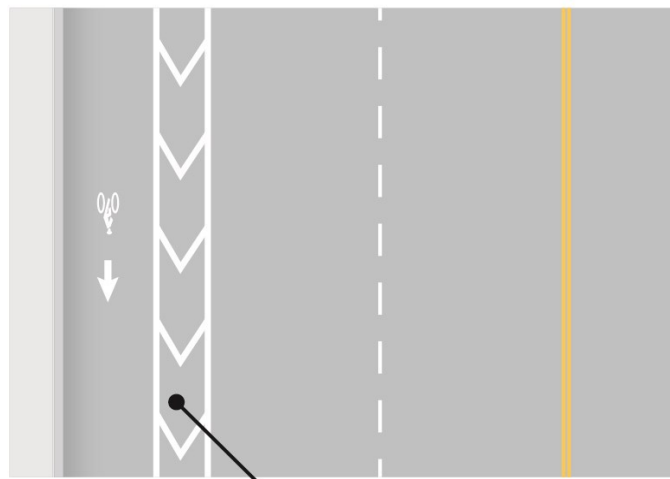
Bike Lanes and Bus Lanes

In most instances, bicycles and buses can share the available road space. On routes heavily traveled by both bicyclists and buses, separation can reduce conflicts (stopped buses hinder bicycle movement and slower moving bicycles hinder buses). Ideally, shared bicycle/bus lanes should be 13 feet to 15 feet wide to allow passing by both buses and bicyclists.

Separate bus lanes and bike lanes should be considered to reduce conflicts between passengers and bicyclists, with the bus lane at the curbside. Buses will be passing bicyclists on the right, but the fewer merging and turning movements reduce overall conflicts.

Buffered Bike Lanes

Buffered bike lanes provide a painted divider between the bike lane and the travel lanes. This additional space can improve the comfort of cyclists as they don't have to ride as close to motor vehicles. Buffered bike lanes can also be used to slow traffic as they narrow the travel lanes. An additional buffer may be used between parked cars and bike lanes to direct cyclists to ride outside of the door zone of the parked cars. Buffered bike lanes are most appropriate on wide, busy streets. They can be used on streets where physically separating the bike lanes with cycle tracks is undesirable for cost, operational, or maintenance reasons.



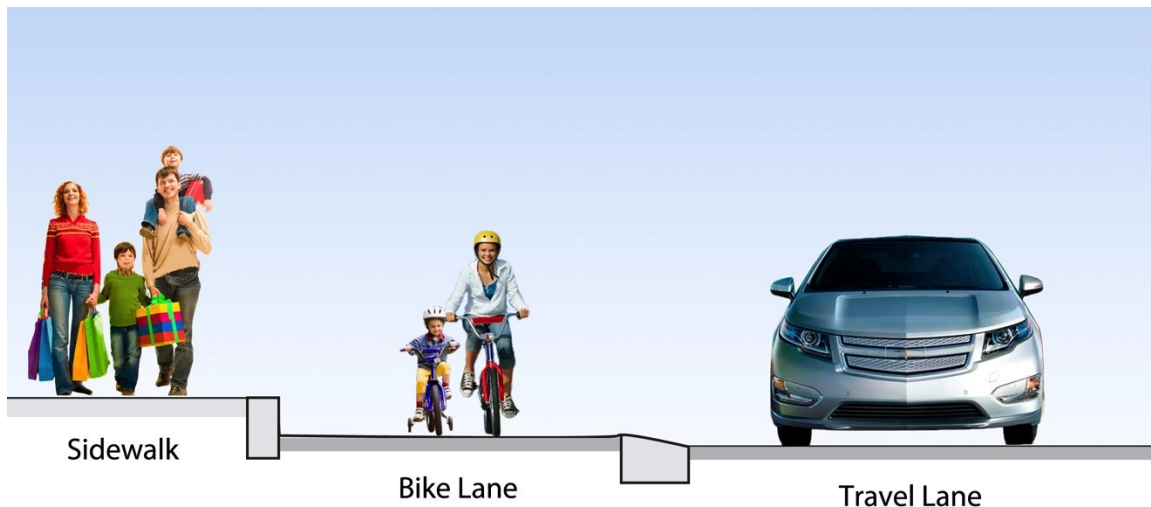
Painted-buffer bike lanes (Credit: Michele Weisbart)

Raised Bike Lanes

Bike lanes are typically an integral portion of the traveled way and are delineated from motor vehicle lanes with painted stripes. Though most bicyclists ride on these facilities comfortably, others prefer more separation. Raised bike lanes incorporate the convenience of riding on the street with some physical separation. This is done by elevating the bicycle lane surface 2 to 4 inches above street level, while providing a traversable curb to separate the bikeway from the motor vehicle travelway. This treatment offers the following advantages:

- Motorists know they are straying from the travel way when they feel the slight bump created by the curb.
- The mountable curb allows motorists to make turns into and out of driveways.
- The mountable curb allows cyclists to enter or leave the bike lane (e.g., for turning left or overtaking another cyclist).
- The raised bike lane drains towards the centerline, leaving it clear of debris and puddles.
- Novice bicyclists are more likely to ride in the bike lane, leaving the sidewalk for pedestrians.

Raised bike lanes can be constructed at little additional expense for new roads. Retrofitting streets with raised bike lanes is more costly; it is best to integrate raised bike lanes into a larger project to remodel the street due to drainage replacement. Special maintenance procedures may be needed to keep raised bike lanes swept.



Raised bike lanes (Credit: Michele Weisbart)

CYCLE TRACKS

Cycle tracks, also known as protected bike lanes, are bikeways located on or adjacent to streets where bicycle traffic is separated from motor vehicle traffic by physical barriers, such as on-street parking, posts/bollards, and landscaped islands. They can be well suited to downtown areas where they minimize traffic conflicts with pedestrians. Streets selected for cycle tracks



Cycle track (Credit: Dan Burden)

should have minimal pedestrian crossings and driveways. They should also have minimal loading/unloading activity and other street activity. The cycle tracks should be designed to minimize conflicts with these activities as well as with pedestrians and driveways.

Cycle tracks can be provided on new facilities, but they require more width than other types of bikeways. They are best suited for existing streets where surplus width is available; the combined width of the cycle track and the barrier is more or less the width of a travel lane. The area to be used by bicycles should be designed with adequate width for street sweeping to ensure that debris will not accumulate. Cycle tracks tend to work most effectively where there are few uncontrolled crossing points with unexpected traffic conflicts. Cycle track concerns include treatment at intersections, uncontrolled midblock driveways and crossings, wrong-way bicycle traffic, and difficulty accessing or exiting the facility at midblock locations. There is some controversy regarding the comparative safety of cycle tracks. Recent studies have concluded that cycle tracks are as safe as other treatments when high usage is expected and when measures such as separate signal phases for right-turning motor vehicle and through cyclists, and left-turning cyclists and through motor vehicles, are deployed to regulate crossing traffic.

SHARED USE PATHS

Shared use paths should be a minimum of 8 feet wide with 2 feet of graded shoulder on each side. This width is suitable in rural or small-town settings. Generally, 12 feet of paved path is preferred. Wider pavement may be needed in high-use areas. Where significant numbers of pedestrians, bicyclists, skaters, and other users use the paths, either wider pavement or separate

INTERSECTIONS

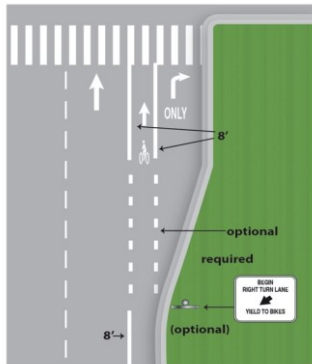
Stencil placed to indicate sensitive area of loop

Loop detectors in bike lane to prolong green phase

Loop detectors in bike lane on side street

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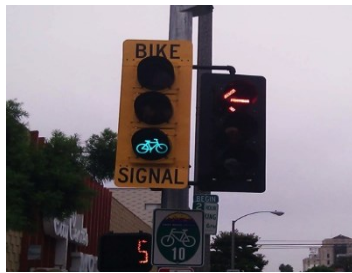
BIKEWAY MARKINGS AT INTERSECTIONS



*Bike lane markings at intersections with right-turn lanes
(Credit: Michele Weisbart)*

Continuing marked bicycle facilities at intersections (up to the crosswalk) ensures that separation, guidance on proper positioning, and awareness by motorists are maintained through these potential conflict areas. The appropriate treatment for right-turn only lanes is to place a bike lane pocket between the right-turn lane and the rightmost through lane. If a full bike lane pocket cannot be accommodated, a shared bicycle/right turn lane can be installed that places a standard-width bike lane on the left side of a dedicated right-turn lane. A dashed strip delineates the space for bicyclists and motorists within the shared lane. This treatment includes signs advising motorists and bicyclists of proper positioning within the lane. Sharrows are another option for marking a bikeway through an intersection where a bike lane pocket cannot be accommodated.

BIKE SIGNAL HEADS



*Bicycle signal head:
Long Beach, CA
(Credit: Charlie Gandy)*

Bicycle signal heads may be installed at signalized intersections to improve identified safety or operational problems for bicyclists; they provide guidance for bicyclists at intersections where bicyclists may have different needs from other road users (e.g., bicycle-only movements and leading bicycle intervals) or to indicate separate bicycle signal phases and other bicycle-specific timing strategies. A bicycle signal should only be used in combination with an existing conventional or hybrid beacon. In the United States, bicycle signal heads typically use standard three-lens signal heads in green, yellow, and red with a stencil of a bicycle.

BICYCLE SIGNAL DETECTION

Bicycle detection is used at actuated traffic signals to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push buttons or by automated means (e.g., in-pavement loops, video, and microwave). Inductive loop vehicle detection at many signalized intersections is calibrated to the size or metallic mass of a vehicle, meaning that bicycles may often go undetected. The result is that bicyclists must either wait for a vehicle to arrive, dismount, and push the pedestrian button (if available), or cross illegally. Loop sensitivity can be increased to detect bicycles. Proper bicycle detection must accurately detect bicyclists (be sensitive to the mass and volume of a bicycle and its rider); and provide clear guidance to bicyclists on how to actuate detection (e.g., what button to push or where to stand).

BIKE BOXES

A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Appropriate locations include:

- At signalized intersections with high bicycle and/or vehicular volumes, especially those with frequent bicyclist left-turns and/or motorist right-turns
- Where there may be right or left-turning conflicts between bicyclists and motorists
- Where there is a desire to better accommodate left-turning bicycle traffic
- Where a left turn is required to follow a designated bike route or boulevard or access a shared-use path, or when the bicycle lane moves to the left side of the street
- When the dominant motor vehicle traffic flows right and bicycle traffic continues through (such as at a Y intersection or access ramp)



*Bicycle box: Portland, OR
(Credit: Ryan Snyder)*

BICYCLE COUNTDOWNS

Near-side bicycle signals may incorporate a “countdown to green” display to provide information about how long until the green bicycle indication is shown, enabling riders to push off as soon as the light turns green.

LEADING BICYCLE INTERVALS

Based on the Leading Pedestrian Interval, a Leading Bicycle Interval (LBI) can be implemented in conjunction with a bicycle signal head. Under an LBI, bicyclists are given a green signal while the vehicular traffic is held at all red for several seconds, providing a head start for bicyclists to advance through the intersection. This treatment is particularly effective in locations where bicyclists are required to make a challenging merge or lane change (e.g., to access a left turn pocket) shortly after the intersection, as the LBI would give them sufficient time to make the merge before being overtaken by vehicular traffic. This treatment can be used to enhance a bicycle box.

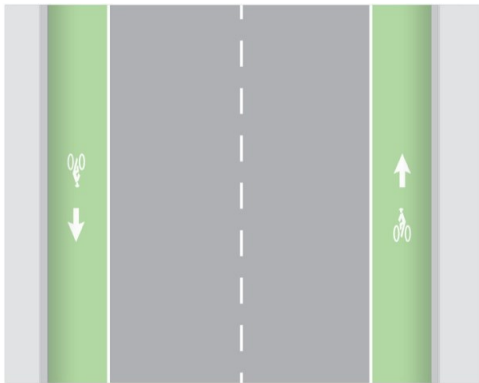
TWO-STAGE TURN QUEUE BOXES

On right side cycle tracks, bicyclists are often unable to merge into traffic to turn left due to physical separation. This makes the provision of two-stage left turns critical in ensuring these facilities are functional. The same principles for two-stage turns apply to both bike lanes and cycle tracks. While two-stage turns may increase bicyclist comfort in many locations, this configuration will typically result in higher average signal delay for bicyclists due to the need to receive two separate green signal indications (one for the through street, followed by one for the cross street) before proceeding.

COLORED PAVEMENT TREATMENTS

Pavement coloring is useful for a variety of applications in conjunction with bicycle facilities. The primary goal of colored pavements is to differentiate specific portions of the traveled way, but colored pavements can also visibly reduce the perceived width of the street.

Colored pavements are used to highlight conflict areas between bicycle lanes and turn lanes, especially where bicycle lanes merge across motor vehicle turn lanes. Colored pavements can be used in conjunction with sharrows (shared lane markings) in heavily used commercial corridors where no other provisions for bicycle facilities are evident.



*Colored bicycle lanes
(Credit: Michele Weisbart)*



*Installation of Green Bicycle Lanes: Norman, OK
(Credit: David Riesland)*

Around the world, a variety of colored treatments for bike lanes have been used. To minimize confusion with other standard traffic control markings, the color green has been selected by the Federal Highway Administration and the MUTCD as the standard color for bicycle facilities of this type. Maintenance of color and surface condition are considerations. Traditional traffic paints and coatings can become slippery. Long life surfaces with good wet skid resistance should be considered.

WAYFINDING



*Wayfinding signs: Seattle, WA
(Credit: Ryan Snyder)*

The ability to navigate through a region is informed by landmarks, natural features, signs, and other visual cues. Wayfinding is a cost-effective and highly visible way to improve the bicycling environment by familiarizing users with the bicycle network, helping users identify the best routes to destinations, addressing misperceptions about time and distance, and helping overcome a barrier to entry for infrequent cyclists (e.g., “interested but concerned” cyclists).

A bikeway wayfinding system is typically composed of signs indicating direction of travel, location of destinations, and travel time/distance to those destinations; pavement markings indicating to bicyclists that they are on

a designated route or bike boulevard and reminding motorists to drive courteously; and maps providing users with information regarding destinations, bicycle facilities, and route options.

Legal Status

A number of the designs discussed above, including cycle tracks, buffered bike lanes next to on-street parking, bike boxes, and colored treatments of travel lanes with sharrows, have not yet been fully approved by the Federal MUTCD or AASHTO and are considered experimental treatments. These devices appear to be promising improvements in bicycle access and safety as they have been widely used in Europe and experimented with in the U.S. Until fully approved, any use of these treatments should follow the appropriate experimental procedures.

BICYCLE PARKING

Secure bicycle parking at likely destinations is an integral part of a bikeway network. Bicycle thefts are common and lack of secure parking is often cited as a reason people hesitate to ride a bicycle. The same consideration should be given to bicyclists as to motorists, who expect convenient and secure parking at all destinations. Bicycle parking should be located in well-lit, secure locations close to the main entrance of a building, no further from the entrance than the closest automobile parking space. Bike parking should not interfere with pedestrian movement.

Bike racks along sidewalks should support the bicycle well, and make it easy to lock a U-shaped lock to the frame of the bike and the rack. The two samples below show an “inverted – U” rack and an art design rack: both meet these criteria. Refer to Chapter 22 of the City of Norman Zoning Ordinance for more information.



*Inverted-U Bike Rack
(Credit: David Riesland)*



*Bicycle Racks Can Double as
Public Art: Norman, OK
(Credit: Donna Riesland)*

MAINTENANCE

Maintenance is a critical part of safe and comfortable bicycle access. Two areas that are of particular importance to bicyclists are pavement quality and drainage grates. Rough surfaces, potholes, and imperfections, such as joints, can cause a rider to lose control and fall. Care must be taken to ensure that drainage grates are bicycle-safe; otherwise a bicycle wheel may fall into the slots of the grate, causing the cyclist to fall. The grate and inlet box must be flush with the adjacent surface. Inlets should be raised after a pavement overlay to the new surface. If this is not possible or practical, the new pavement should taper into drainage inlets so the inlet edge is not abrupt.

The most effective way to avoid drainage-grate problems is to eliminate them entirely with the use of inlets in the curb face. This may require more grates to handle bypass flow, but is the most bicycle-friendly design.

IMPLEMENTATION

Implementation of a bikeway network often requires an implementation plan. The City's Comprehensive Transportation Plan provides information relative to the bicycle network and how to incorporate bicycle facilities with new and existing roadway facilities. Some bikeways, such as paths, bicycle boulevards, and other innovative techniques described in this guide, will require a capital improvement project process, including identifying funding, a public and environmental review process, and plan preparation. Other bikeway improvements often are implemented as part of planned construction, such as resurfacing, reconstruction, or utility work.

The majority of bikeway facilities are provided on streets in the form of shared roadways or bicycle lanes. Shared roadways usually require virtually no change to existing roadways, except for some directional signs, occasional markings, and minor changes in traffic control devices; removing unnecessary centerline stripes is a strategy that can be implemented after resurfacing

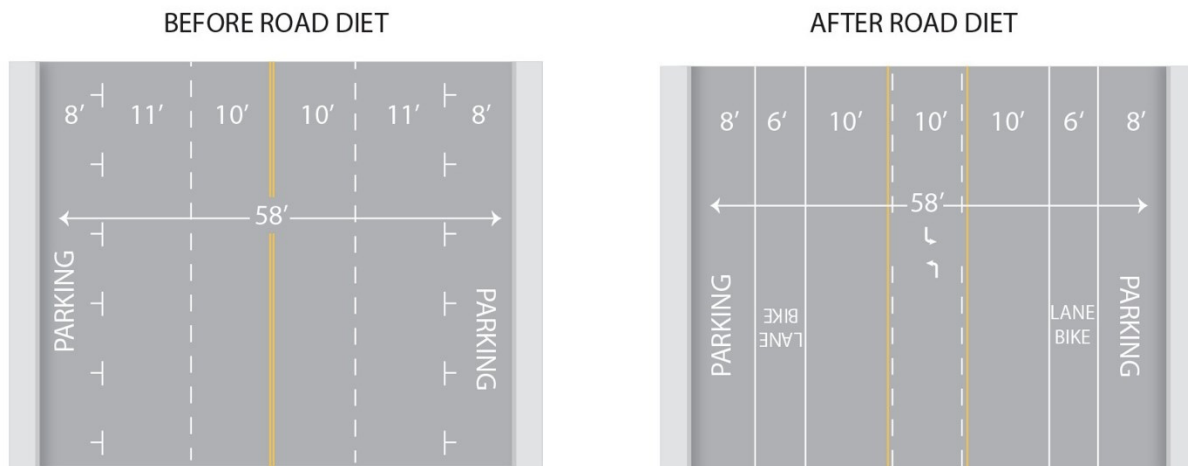
projects. Striped bike lanes are implemented on existing roads through use of the strategies below.

RESURFACING

The cost of striping bicycle lanes is negligible when incorporated with resurfacing, as this avoids the high cost of stripe removal; the fresh pavement provides a blank slate. Jurisdictions will need to anticipate opportunities and synchronize restriping plans with repaving and reconstruction plans. If new pavement is not anticipated in the near future, grinding out the old lane lines can still provide bike lanes.

There are three basic techniques for finding room for bike lanes:

- **Lane narrowing.** Where all existing or planned travel lanes must be retained, travel lanes may be narrowed to provide space for bike lanes where applicable.
- **Road diets.** Reducing the number of travel lanes provides space for bicycle lanes. Many streets have more space for vehicular traffic than necessary. Some streets may require a traffic and/or environmental analysis to determine whether additional needs or impacts may be anticipated. The traditional road diet changes a four-lane undivided street to two travel lanes, a continuous left-turn lane (or median), and bike lanes. In other cases, a four-lane street can be reduced to a two-lane street without a center-turn lane if there are few left turns movements. One-way couplets are good lane-reduction candidates if they have more travel lanes in one direction than necessary for the traffic volumes. For example, a four-lane one-way street can be reduced to three lanes and a bike lane. Since only one bike lane is needed on a one-way street, removing a travel lane can free enough room for other features, such as on-street parking or wider sidewalks. Both legs of a couplet must be treated equally, so there is a bike lane in each direction.



Fitting in bicycle lanes with road diets (Credit: Michele Weisbart)

- Parking Removal.** On-street parking is vital on certain streets (such as residential or traditional central business districts with little or no off-street parking), but other streets have allowable parking without a significant visible demand. In these cases, parking prohibition can be used to provide bike lanes with minimal public inconvenience.

UTILITY WORK

Utility work often requires reconstructing the street surface to complete restoration work. This provides opportunities to implement bike lanes and more complex bikeways such as bike boulevards, cycle tracks, or paths. It is necessary to provide plans for proper implementation and design of bikeway facilities prior to the utility work. It is equally necessary to ensure that existing bikeways are replaced where they exist prior to utility construction.

REDEVELOPMENT

When streets are slated for reconstruction in conjunction with redevelopment, opportunities exist to integrate bicycle lanes or other facilities into the redevelopment plans.

PAVED SHOULDERS

Adding paved shoulders to existing roads can be quite expensive if done as stand-alone, capital improvement projects, especially if ditch lines have to be moved, or if open drains are changed to enclosed drains. However, paved shoulders can be added at little extra cost if they are incorporated into projects that already disturb the area beyond the pavement, such as laying utility lines or drainage work.

ADDITIONAL RESOURCES

- National Association of City Transportation Officials, *Urban Bikeway Design Guide*, 2011
- Caltrans, *Complete Intersections: A Guide to Restructuring Intersections and Interchanges for Bicyclists and Pedestrians*, 2010
- AASHTO *Guide for the Development of Bicycle Facilities*

8. TRANSIT ACCOMMODATIONS

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INTRODUCTION

Public transit serves a vital transportation function for many people; it is their access to jobs, school, shopping, recreation, visitation, worship, and other daily functions. Except for subways and rail lines on exclusive rights-of-way, most transit uses streets. For transit to provide optimal service, streets must accommodate transit vehicles as well as access to stops. Transit connects passengers to destinations and is an integral component of shaping future growth into a more sustainable form. Transit design should also support placemaking.



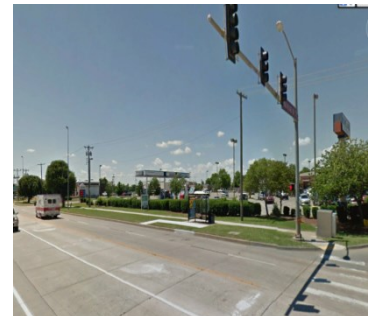
Bus Stops Should be Designed for Passengers (Credit: David Riesland)

This chapter provides design guidance for both transit stops and transit operating in the streets, including bus stop layout and placement and the use of bus bulbs and transit lanes. The chapter ends with a discussion of ways to accommodate light rail, street cars, and Bus Rapid Transit (BRT).

ESSENTIAL PRINCIPLES OF DESIGNING STREETS FOR TRANSIT

Public transit should be planned and designed as part of the street system. It should interface seamlessly with other modes, recognizing that successful transit depends on customers getting to the service via walking, bicycling, car, taxi, or paratransit. Transit should be planned following these principles:

- Transit has a high priority on city streets. On some streets, transit vehicles should have higher priority than private vehicles.
- The busiest transit lines should have designated bus lanes.
- Where ridership justifies, some streets, called transit malls, may permit only buses or trains in the travelled way. These often also allow bicycles.
- Technology should be applied to increase average speeds of transit vehicles where appropriate.
- Transit stops should be easily accessible, with safe and convenient crossing opportunities.
- Transit stops should be active and attractive public spaces that attract people on a regular basis, at various times of day, and all days of the week.
- Transit stops function as community destinations. The largest stops and stations should be designed to facilitate programming for a range of community activities and events.



Bus Stops are Centers of Activity (Credit: David Riesland)



Bus Stop Amenities (Credit: David Riesland)

- Transit stops should include amenities for passengers waiting to board.
- Transit stops should provide space for a variety of amenities in commercial areas, to serve residents, shoppers, and commuters alike.
- Transit stops should be attractive and visible from a distance.
- Transit stop placement and design influences accessibility to transit and network operations, and influences travel behavior/mode choice.
- Zoning codes, local land use ordinances, and design guidelines around transit stations should encourage walking and a mix of land uses (see Chapter 12, “Designing Land Use along Living Streets”).
- Streets that connect neighborhoods to transit facilities should be especially attractive, comfortable, and safe and inviting for pedestrians and bicyclists.

ACCESS TO TRANSIT

Transit depends primarily on walking to function well; most transit users walk to and from transit stops. Sidewalks on streets served by transit and on the streets that lead to transit corridors provide basic access. Bicycle-friendly streets do the same for those who access transit by bicycle.

Every transit trip also requires a safe and convenient street crossing at the transit stop; a disproportionately high number of pedestrian crossing crashes occur at transit stops. Every transit stop should be evaluated for its crossing opportunities. If the crossing is deemed unsafe, mitigation can occur in two ways: a crossing should be provided at the existing stop, or the stop can be moved to a location with a safer crossing. For street crossing measures, see Chapter 6, “Pedestrian Crossings.” Simply stated, there should not be transit stops without means to safely and conveniently cross the street.

Simply moving a stop is not always a service to transit users who may have to walk further to access their stop. Convenient access by passengers must remain at the forefront of all transit stop planning: eliminating stops because they are perceived as unsafe will not be satisfactory to riders who cannot walk very far. However, eliminating or consolidating stops can be beneficial to transit operations and users by reducing the number of times a bus, streetcar, or light rail train has to stop. The trade-offs are added walking time for users but reduced transit operator delay, resulting in a shorter journey overall. For example, this might mean a two to three minute longer walk for some passengers but an eight to 10 minute shorter bus ride for all.

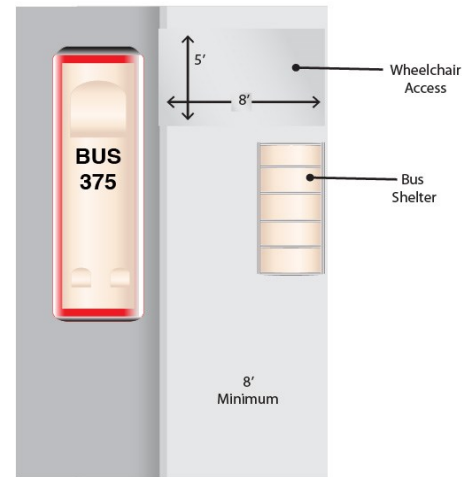
BUS STOPS

The following sections provide guidance for designing bus stops.

LAYOUT

A well placed and configured transit stop offers the following characteristics:

- Clearly defines the stop as a special place
- Provides a visual cue on where to wait for a transit vehicle
- Does not block the path of travel on the adjacent sidewalk
- Allows for ease of access between the sidewalk, the transit stop, and the transit vehicle



*ADA compliant bus stop
(Credit: Michele Weisbart)*

Layout guidelines include the following:

- Consolidate streetscape elements to create a clear waiting space and minimize obstructions between the sidewalk, waiting area, and boarding area
- Consider the use of special paving treatments or curb extensions (where there is on-street parking) to distinguish transit stops from the adjacent sidewalks
- Integrate transit stops with adjacent activity centers whenever possible to create active and safe places
- Avoid locating bus stops adjacent to driveways, curb cuts, and land uses that generate a large number of automobile trips (gas stations, drive-thru restaurants, etc.)

Transit stops are required by the Americans with Disabilities Act (ADA) to be accessible. Specifically, ADA requires a clear loading area (minimum 5 feet by 8 feet) perpendicular to the curb with a maximum 2 percent cross-slope to allow a transit vehicle to extend its lift to allow people with disabilities to board. The loading area should be located where the transit vehicle has its lift and be accessible directly from a transit shelter. The stop must also provide 30 by 40 inches of clear space within a shelter to accommodate wheelchairs. The greater use of low-floor transit vehicles may make this requirement moot; but it will still be necessary to provide enough room so wheelchair users can access all doors.

TRANSIT-SPECIFIC STREETSCAPE ELEMENTS

The essential streetscape elements for transit include signs, shelters, and benches.

Flag signs indicate where people are to wait and board a transit vehicle. The signs should clearly identify the transit operator, route number, and schedule. Maps showing the transit lines servicing that stop, local destinations, and additional transfer transit lines should also be provided. Flag signs should be located towards the front of the stop.

Benches should be provided at transit stops with headways longer than five minutes.

Shelters keep waiting passengers out of the rain and sun and provide increased comfort and security. Shelters vary in size and design; standard shelters are 3 to 7 feet wide and 6 to 16 feet long. They include covered seating and sign panels that can be used for transit information. Shelters should:

- Be provided at transit stops with headways longer than 10 minutes
- Have electrical connections to power lighting and/or real-time transit information, or accommodate solar power



*Bus stop shelter
(Credit: David Riesland)*

Be set back from the front of the bus stop to allow for the bus to merge into travel lanes when the stop is located at the far side of an intersection or at a mid-block location. This setback is not required when the stop is located at the near side of the intersection or at a bus bulb.

Shelters should be located in a sidewalk's furniture zone so they don't conflict with the pedestrian zone. Shelters may be placed in the sidewalk's frontage zone provided that they do not block building entrances or the pedestrian zone.

Transit stops should also provide other amenities to make waiting for the next bus comfortable:

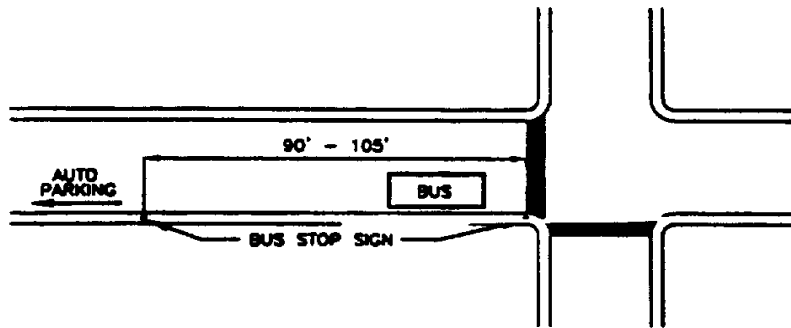
- Trash/recycling receptacles should be provided and maintained at most stops.
- Depending on headways and the number of passengers boarding and alighting, electronic "next bus" readouts can be used to inform passengers when to expect the next bus.
- Very busy bus stops and transit stations should include space for vendors to sell newspapers, magazines, flowers, and other goods to keep the stops lively.
- Rapid bus lines can include facilities that allow passengers to pay their fare before boarding the bus. Along with wide doors on buses, this allows buses to reduce their travel time by reducing dwell time at stops.



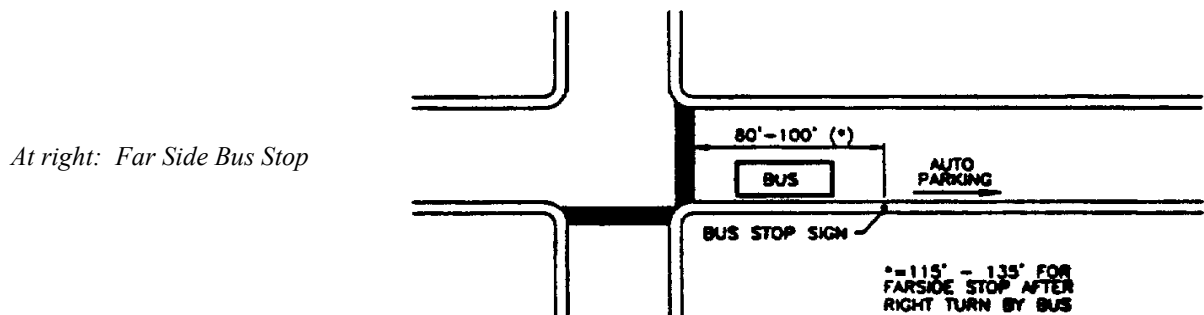
*Pre-board fare payment
system: Guangzhou, China
(Credit: Ryan Snyder)*

BUS STOP PLACEMENT

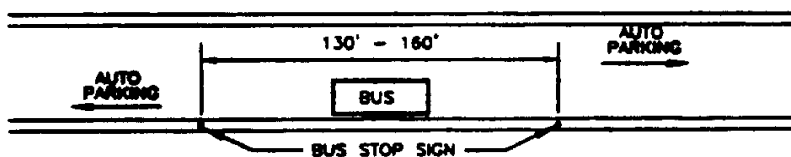
A bus stop's optimal placement depends on the operational characteristics of the roadway and transit system. The placement of bus stops at the far side of signalized intersections is generally preferred to near side or mid-block locations. The location of all bus stops should take into account the existing infrastructure such as sidewalks, marked crosswalks, street lighting, etc. The different stop location types are shown graphically below.



At left: Near Side Bus Stop



At right: Far Side Bus Stop



At left: Mid-Block Bus Stop

However, each location type has its advantages and disadvantages, as shown in Table 8.1.

Table 8.1 Bus Stop Placement Considerations

Location	Advantage	Disadvantage
Near Side	<ul style="list-style-type: none"> Minimizes interference when traffic is heavy on the far side of an intersection Provides an area for a bus to pull away from the curb and merge with traffic Minimizes the number of stops for buses Allows passengers to board and alight while the bus is stopped at a red light Allows passengers to board and alight without crossing the street if their destination is on the same side of the street. This is most important where one side of the street has an important destination, such as a school, shopping center, or employment center that generates more passenger demand than the far side. 	<ul style="list-style-type: none"> Increases conflicts with right-turning vehicles Stopped buses may obscure curb-side traffic control devices and crossing pedestrians Obscures sight distances for vehicles crossing the intersection that are stopped to the right of the buses Decreases roadway capacity during peak periods due to buses queuing in through lanes near bus stops Decreases sight distance of on-coming traffic for pedestrians Can delay buses that arrive during the green signal phase and finish boarding during the red phase Less safe for passengers crossing in front of bus
Far Side	<ul style="list-style-type: none"> Minimizes conflicts between right-turning vehicles and buses Optimal location for traffic signal synchronized corridors Provides additional right-turn capacity by allowing traffic to use the right lane Improves sight distance for buses approaching intersections Requires shorter bus deceleration distances Signalized intersections create traffic gaps for buses to reenter traffic lanes Improves pedestrian safety as passengers cross in back of the bus 	<ul style="list-style-type: none"> Queuing buses may block the intersection during peak periods Sight distance may be obstructed for vehicles approaching intersections May increase the number of rear-end accidents if drivers do not expect a bus to stop after crossing an intersection Stopping both at a signalized intersection and a far-side stop may interfere with bus operations
Mid-Block	<ul style="list-style-type: none"> Minimizes sight distance problems for pedestrians and vehicles Boarding areas experience less congestion and conflicts with pedestrian travel paths Can be located near a major transit midblock use generator 	<ul style="list-style-type: none"> Decreases on-street parking supply (unless mitigated with a curb extension) Requires a mid-block pedestrian crossing Increases walking distance to intersections Stopping buses and mid-block pedestrian crossings may disrupt mid-block traffic flow

Source: Federal Transit Administration, BRT Stops, Spacing, Location, and Design, www.fta.dot.gov/research_4361.html

In general, bus stops should be located at the far side of a signalized intersection in order to enhance the effectiveness of traffic signal synchronization or bus signal priority projects. Near-side bus stops are appropriate for stop sign-controlled intersections. Regardless, in all cases priority should be given to the location that best serves the passengers.

SIGNAL TREATMENT

Signal prioritization is a component of technology-based “intelligent transportation systems” (ITS). These systems are often used by road authorities in conjunction with transit agencies to help improve a roadway system’s overall operations in the following ways:

- Reduce traffic signal delays for transit vehicles
- Reduce the need for transit vehicles to stop for traffic at intersections
- Help reduce transit vehicles’ travel time
- Help improve transit system reliability and reduce waiting time for people at transit stops

Signal prioritization projects include signal timing or phasing projects and transit signal priority projects.

Signal timing projects optimize the traffic signals along a corridor to make better use of available green time capacity by favoring a peak directional traffic flow. These passive systems give priority to roadways with significant transit use within a district-wide traffic signal timing scheme. Transit signal prioritization can also be achieved by timing a corridor’s traffic signals based on a bus’s average operating speed instead of an automobile’s average speed.

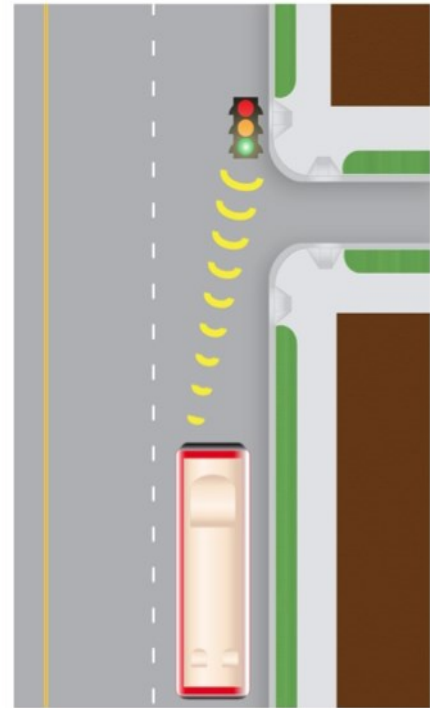
Transit signal-priority projects alter a traffic signal’s phasing as a transit vehicle approaches an intersection. This active system requires the installation of specialized equipment at an intersection’s traffic signal controller and on the transit vehicle. It can either give an early green signal or hold a green signal that is already being displayed in order to allow buses that are operating behind schedule to get back on schedule. Signal-priority projects also help improve a transit system’s schedule adherence, operating time, and reliability.

Although they may use similar equipment, signal-priority and pre-emption are two different processes. Signal-priority modifies the normal signal operation process to better accommodate transit vehicles, while signal pre-emption interrupts the normal signal to favor transit or emergency vehicles.

The placement of a bus stop at the far side of a signalized intersection increases the effectiveness of transit signal-priority projects. Signal treatments should be used along streets with significant bus service.

BUS BAY

DESCRIPTION



*Signal-priority technology can help to reduce delay for buses
(Credit: Michele Weisbart)*

Bus bays can come in several forms, depending on land use, roadway design, traffic flows, and available right-of-ways. Bus bays allow buses to pick up and drop off passengers outside of the travel lane. As a result, this allows traffic to flow unobstructed while the bus is stopped. The primary types of bus bays are:

- Parallel bus bays (also referred to as bus bays, bus turn-outs, or berth)
- Saw tooth bus bays (most often used in off-street bus stopping areas)

USAGE FACTORS

Locations that should be considered for bus bays are:

- Traffic speeds exceeding 40mph
- Average peak-period dwell time exceeds 30 seconds per bus
- Buses that are expected to lay over
- Multiple buses serve the stop at the same time
- History of vehicles colliding into rear of bus

BUS BULBS

Bus bulbs are curb extensions that extend the length of the transit stop on streets with on-street parking. They improve transit performance by eliminating the need for buses to merge into mixed traffic after every stop. They also facilitate passenger boarding by allowing the bus to align directly with the curb; waiting passengers can enter the bus immediately after it has stopped. They improve pedestrian conditions by providing additional space for people to wait for transit and by allowing the placement of bus shelters where they do not conflict with a sidewalk's pedestrian zone. Bus bulbs also reduce the crossing distance of a street for pedestrians if they are located at a crossing. In most situations, buses picking up passengers at bus bulbs block the curbside travel lane; but this is mitigated by the reduced dwell time, as it takes less time for the bus driver to position the bus correctly, and less time for passengers to board.



Bus bulb: Alhambra, CA (Credit: Sky Yim)



Bus bulb: Huntington Park, CA (Credit: Sky Yim)

One major advantage of bus bulbs over pulling over to the curb is that they require less parking removal: typically two on-street parking spots for a bus bulb instead of four for pulling over.

The following conditions should be given priority for the placement of transit bus bulbs:

- Where transit performance is significantly slowed by the transit vehicle's merging into a mixed-flow travel lane
- Roadways served by express or BRT lines
- Stops that serve as major transfer points
- Areas with heavy transit and pedestrian activity and where narrow sidewalks do not allow for the placement of a bus shelter without conflicting with the pedestrian zone

Bus bulbs should not be considered for stops with any of the following:

- A queue-jumping lane provided for buses
- On-street parking prohibited during peak travel periods
- Near-side stops located at intersections with heavy right-turn movements, except along streets with a "transit-first" policy

CHARACTERISTICS

At a minimum, bus bulbs should be long enough to accommodate all doors of a transit vehicle to allow for the boarding and alighting of all passengers, or be long enough to accommodate two or more buses (with a 5-foot clearance between buses and a 10-foot clearance behind a bus) where there is frequent service such as with BRT or other express lines. Bus bulbs located on the far side of a signalized intersection should be long enough to accommodate the complete length of a bus so that the rear of the bus does not intrude into the intersection.

Table 8.2 Standard Transit Vehicle and Transit Bus Bulb Dimensions

Vehicle	Length (feet)	Number of Buses at Stop	Platform Length (feet)	
			Near Side	Far Side
Standard bus	40	1	35	45
		2	55	65
Articulated bus	60	1	80	90
		2	120	130

Federal Transit Administration, August 2004. *Characteristics of Bus Rapid Transit for Decision Making Project*
NO: FTA-VA-26-7222-2004.1

URBAN DESIGN

Bus stops and amenities vary in complexity and design from standardized off-the-shelf signs and furniture to specially designed elements. The design of the bus stop elements, location of the bus stop in relation to adjacent land uses or activities, and the quality of the roadway's pedestrian environment contribute to a bus stop's placemaking. Transit operators like a branded look to their stops so they are easily identified, but often there is room for customized designs to fit in with the neighborhood, with at least some of the features and amenities.



*Bus Stops Should be Integrated with Their Surroundings: Norman, OK
(Credit: David Riesland)*

BICYCLE CONNECTIONS

Connecting bicycle facilities to transit stations helps extend the trip length for cyclists and reduces automobile travel. Secure bicycle parking must be provided at or within close proximity to a bus stop, preferably sheltered. At a minimum, the accommodations can be bike racks or lockers. Bike stations and automated bicycle parking can be located at areas with high levels of transit and bicycle use.



*Bicycle Facilities at Transit Stations Encourage Intermodal Travel: Norman, OK
(Credit: David Riesland)*

BUS LANES

Bus lanes provide exclusive or semi-exclusive use for transit vehicles to improve the transit system's travel time and operating efficiency by separating transit from congested travel lanes. They can be located in an exclusive right-of-way or share a roadway right-of-way. They can be physically separated from other travel lanes or differentiated by lane markings and signs.

Bus lanes can be located within a roadway median or along a curb-side lane, and are identified by lane markings and signs. They should generally be at least 11 feet wide, but where bicycles share the lane with buses, 13 to 15 feet wide is preferred. When creating bus lanes, cities should consider the following:

- Exclusive transit use may be limited to peak travel periods or shared with high-occupancy vehicles.
- On-street parking may be allowed depending on roadway design, especially with bus lanes located in the center of the street.
- A mixed-flow lane or on-street parking may be displaced; this is preferable to adding a lane to an already wide roadway, which increases the crossing distance for pedestrians and creates other problems discussed in other chapters.
- Within a mixed-flow lane, the roadway can be delineated by striping and signs.
- High-occupancy vehicles and/or bicycles may be permitted to use bus lanes.

Pedestrian access to stations becomes an issue when bus lanes are located in roadway medians.



*Bus-Only Lane: Norman, OK
(Credit: David Riesland)*

ACCOMMODATING LIGHT RAIL, STREET CARS, AND BRT

A growing number of streets have light rail lines, street cars, or BRT. These need to be carefully designed into the street.

The various options for accommodating light rail, street cars, and BRT within streets are as follows:



*Light-rail in urban street: Salt Lake City
(Credit: Paul Zykovsky)*

- Center-running
- Two-way split-side, with one direction of transit flow in each direction
- Two-way single-side, with both directions of transit flow on one side of the street right-of-way
- One-way single-side, with transit running one direction (either with or against the flow of vehicular traffic) and usually operating in a one-way couplet on parallel streets.



*Bus Rapid Transit: Bogotá, Colombia
(Credit: Ryan Snyder)*

For each configuration, transit can operate in a reserved guideway or in mixed street traffic. When installing light rail or street cars within streets, the safety of pedestrians and bicyclists needs to be fully provided for. If poorly designed, these transit lines introduce hazards and serve to divide neighborhoods where crossings are highly limited and/or difficult or inconvenient (see Chapter 6, “Pedestrian Crossings” for more guidance). In general, in areas of high pedestrian activity, the speed of the transit service should be compatible with the speed of pedestrians.

The potential for each configuration is influenced by the street type. Some transit configurations will not work effectively in combination with certain street types. The following table outlines the compatibility of each configuration with the four street types.

Table 8.3 Street Types and Transit Configurations

	Center Running		Two-Way Split Side		Two-Way Single Side		One-Way Single Side	
Street Type	Reserved Guideway	In Street	Reserved Guideway	In Street	Reserved Guideway	In Street	Reserved Guideway	In Street
Boulevard	Y	N	N	Y	Y	N	Y*	Y
Multi-way Boulevard	Y	N*	Y	Y	N	N	Y*	Y
Avenue	Y	Y	Y*	Y	Y*	N	Y	Y
Street	N	Y	Y	Y	N*	N	Y	Y

Notes

Y = Recommended street type/transit configuration combination

N = Not recommended/possible street type/transit configuration combination

*Denotes configurations that may be possible under certain circumstances, but are not usually optimal

Source: Integration of Transit into Urban Thoroughfare Design, DRAFT White Paper prepared by the Center for Transit-Oriented Development, updated: November 9, 2007.

9. TRAFFIC CALMING

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DEFINITION

While the definition of traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users, the City of Norman experience shows that non-physical measures can also produce similar traffic calming results.



Traffic calmed street (Credit: Dan Burden)

The phrase, “the combination of mainly physical measures,” means physical and non-physical measures plus a supportive policy environment such that traffic calming is permitted and encouraged. Non-physical measures promote similar behavior.

“Reduce the negative effects of motor vehicle use” means changing the role and design of streets to accommodate motorists in ways that reduce the negative social and environmental effects on individuals, neighborhoods, districts, retail areas, corridors, downtowns, and society in general (e.g., reduced speeds, reduced sense of intrusion/dominance, reduced energy consumption and pollution, reduced sprawl, and reduced automobile dependence).

“Alter driver behavior” means that the street design helps a driver to self-enforce lower speeds, resulting in less aggressive driving and increased respect for non-motorized users of the street.

“Improve conditions for non-motorized street users” means promoting walking and cycling, changing expectations of all street users to support equitable use of the street, increasing safety and comfort (i.e., the feeling of safety), improving the aesthetics of the street, and supporting the context of the street.

Therefore, the definition of traffic calming is broad enough to apply to a myriad of contexts and situations but specific enough to have independent meaning so that it is not confused with other street design elements and design approaches.

Through design, traffic calming aims to slow the speeds of motorists to the “desired speed” in a context-sensitive manner by working with the stakeholders (i.e., residents, business owners, and agencies). Traffic calming is acceptable on all street types where pedestrians are allowed.

Traffic calming typically connotes a street or group of streets that employ traffic calming measures with a “self-enforcing” quality that encourages motorists to drive at the desired speed. When a group of streets are involved, it is normally referred to as “area-wide calming.”

Traffic calming measures can also be designed to treat and manage stormwater.

CATEGORIES

From a policy and design perspective, traffic calming measures fall into two broad categories: those that are appropriate for “framework” streets and those that are appropriate for both framework streets and “non-framework” streets. Framework streets are streets that (i) connect places, neighborhoods, and districts (usually most boulevards and avenues) and/or (ii) serve as emergency vehicle routes. The sorts of traffic calming measures that are appropriate on framework streets include “cross-section measures” because emergency response times are generally unaffected by cross-section changes. Non-framework streets are all the other streets in the street network. The majority of streets in cities are non-framework streets. Non-framework streets provide access to houses, businesses, offices, and parks. The sorts of traffic calming measures that are appropriate for non-framework streets include cross-section measures and “periodic measures.” Periodic measures are spaced intermittently, rather than continuously. They are very popular on non-framework streets because they are inexpensive when compared to cross-section measures, which typically require construction along the entire length of the street. Examples of both types of measures and guidance for their use are shown above and below.



*Cross section traffic calming measure: Santa Monica, CA
(Credit: Ryan Snyder)*



Periodic traffic calming measure: Raised crosswalk in Seattle, WA (Credit: Ryan Snyder)

The correct terminology for all traffic calming measures is “measures” not “devices.” “Devices” could imply a degree of portability that may not apply to all traffic calming measures. The City of Norman has historically interchanged the two terms. Regardless, adding street trees and changing the paving material to provide texture or contrast, for example, are measures to alter behavior and perceptions but they are clearly not “devices.” Traffic control “devices” are really a subset of all traffic control “measures”.



Partial closure: Riverside, CA (Credit: Ryan Snyder)

Technically, “route modification measures” are not traffic calming measures. The City of Norman recognizes that these can be useful in some circumstances to improve safety. Examples of route modifications measures include street closures, partial closures, turn prohibitions, diverters, and one-way streets. Route modifications effectively remove connectivity to parts of the network. As these measures are likely to be considered drastic to some, their implementation should be fully embraced by all stakeholders. As such, these measures are not generally applied to new streets. In general, route modification should be used sparingly.

Lastly, signs and pavement markings are often used in conjunction with traffic calming measures, but they are traffic control devices. As such, they are considered non-physical measures.

SAFETY

The greatest benefit of traffic calming is increased safety. Compared with conventionally designed streets, traffic calmed streets typically have fewer collisions and even higher reductions in injuries and fatalities. These dramatic safety benefits are mostly the result of slower speeds for motorists that result in greater driver awareness, wider fields of vision, shorter stopping distances, and less kinetic energy during a collision. At lower speeds, chances are higher that a motorist will not kill or severely injure a pedestrian in a collision. Other contributing factors to these improved safety results include a more legible street environment and design advantages for pedestrians and cyclists. Bulb-outs on corners of intersections, for example, allow pedestrians to see past parked cars prior to crossing the street.



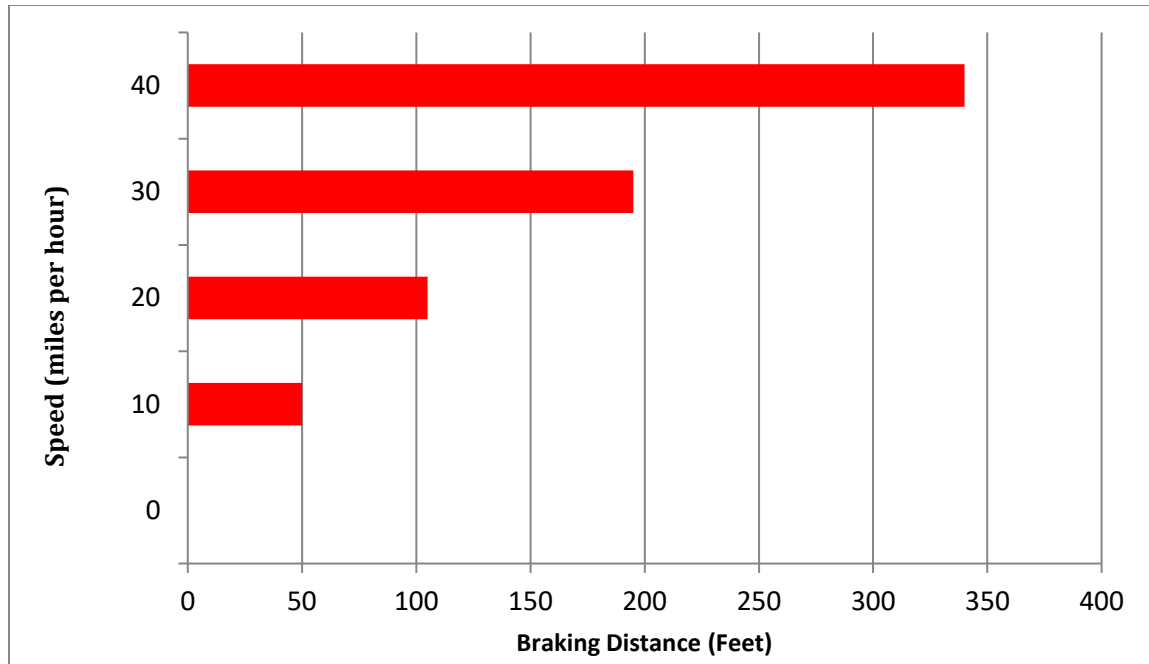
Peripheral vision at 15 mph



Peripheral vision at 30 mph

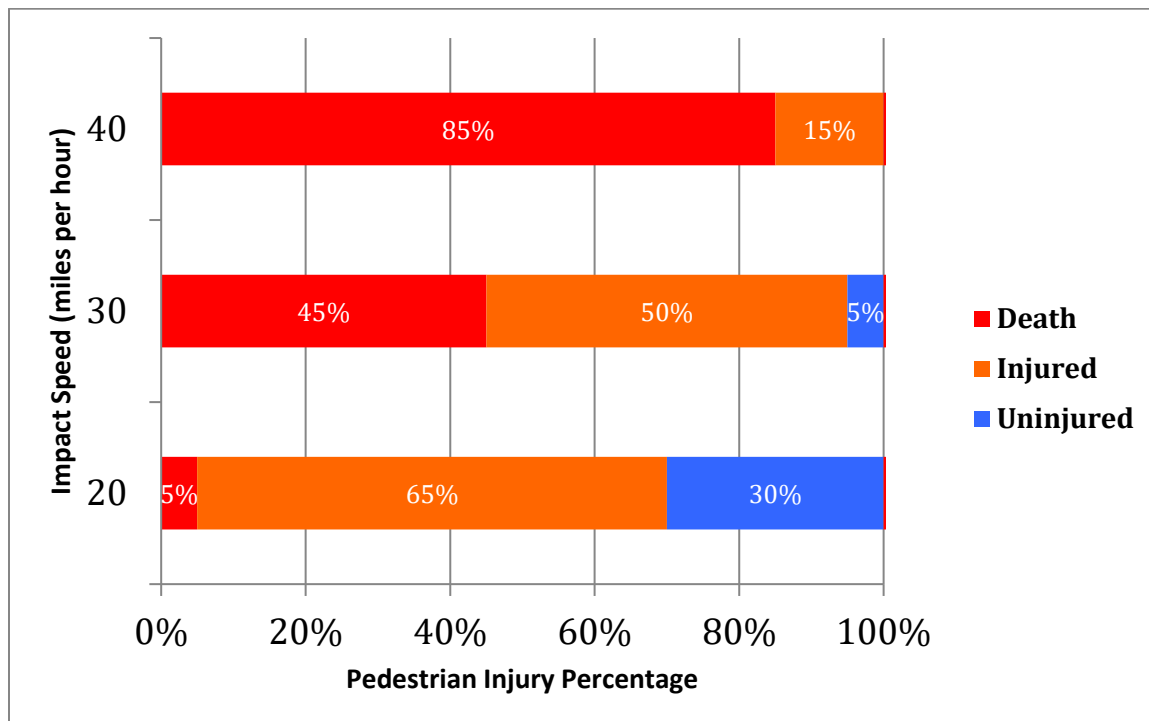
Peripheral vision decreases at higher speeds. (Credit: Michele Weisbart)

The accommodation and comfort of pedestrians increases greatly as speeds lower. For example, acceptable gaps (i.e., the space between moving vehicles) are better judged at slower speeds. Also, at 25 mph or less drivers are much more likely to yield to pedestrians and let them cross the street than at over 25 mph. The chart below shows that it takes a longer distance to brake and come to a full stop as speeds increase.



Source: (Federal Highway Administration Pedestrian Safety Design Course)

The chart below illustrates that crashes become more severe with speed.



Source: *Killing Speed and Saving Lives*, UK Department of Transportation.

EMERGENCY RESPONSE AND NUMBER OF PERIODIC MEASURES



Designing traffic calming to accommodate emergency response. (Credit: Dan Burden)

It is important to have a network of framework streets so that emergency personnel can get to, or reasonably close to, calls without encountering too many periodic measures. In this way, all or most of the length of the responders' trips are on framework streets and, if any periodic measures are encountered, then they are encountered only towards the end of the trip. From an emergency perspective and a public acceptability perspective, it is important to limit the number of periodic measures in a row on non-framework streets. The rule of thumb is, on the routes between two framework streets there should be no more than 8 to 12 periodic measures. City of Norman historical policies have been to install fewer than these numbers. If more

than 8 to 12 periodic measures are used in a row, motorists who use the streets will become highly irritated with the measures and will have them removed. This rule of thumb effectively limits the length of single-street traffic calming projects. It also limits the size of the area for area-wide calming (i.e., the maximum limit is 8 to 12 multiplied by the spacing between the measures).

To achieve a desired speed of 25 mph using periodic measures, the spacing between the measures should be about 300 feet. Typically, measures are constructed at the obvious locations (i.e., pedestrian crossings, intersections, and curves) and then subsequent measures are filled in to attain the correct spacing. In this way, a slow and steady speed profile is achieved; there is little opportunity or utility for motorists to speed up between the measures.

EXCEPTIONS

There are two general exceptions to the above recommendations:

- Some local streets should be classified as framework streets due to their long lengths and inability to be effectively calmed with no more than 8 to 12 periodic measures at the correct spacing.
- Periodic measures may be appropriate on framework streets in some situations. Examples include locations with heavy pedestrian generators (e.g., at elementary schools, community centers, entertainment venues, and key intersections along a main street or in a downtown).

DESIGN VEHICLE

In general, all public streets and traffic calming measures should be designed to accommodate a WB-40 design vehicle (i.e., a tractor trailer with a 40-foot wheel base). The WB-40 design vehicle uses more space to turn than fire trucks, school buses, garbage trucks, and most service trucks. Therefore, if the WB-40 fits, all the rest fit. On streets where larger design vehicles are permitted and are expected to use the streets regularly, then the design vehicle should be changed accordingly. On high frequency bus routes where encroachment into opposing lanes would cause excessive delays to the buses, the affected radii should be altered accordingly. While all streets should be designed to accommodate WB-40 vehicles, they should not be the primary design vehicle on non-framework streets. This does not mean that every radius must be large enough to accommodate them as large trucks may use the full width of the street they are turning into. These streets are generally narrow and require slowing to turn at intersections, especially for large vehicles.

NEIGHBORHOOD TRAFFIC MANAGEMENT & CALMING PROGRAM

The City of Norman's *Neighborhood Traffic Management and Calming Program* manual (NTMCP) was developed in December, 2003 and was adopted by the Norman City Council on February 24, 2009. It came about due to the complaints of citizens who looked to the City to address their many concerns about traffic speeding through their neighborhoods thereby making their streets less safe and, consequently, less liveable. City staff researched numerous communities where traffic calming was practiced and what calming measures were utilized. From this effort, the City produced a comprehensive document that established guidelines for the City's neighborhood-driven Traffic Calming Program. The manual identifies both physical and non-physical traffic calming measures, and covers the topics of eligibility, excluded routes, prioritization, impacts, removal of calming measures, etc. Neighborhood collector streets were the targeted streets of the program because of their relatively high traffic volumes and speeds, but the qualifying criteria allows the concept of traffic calming, in one form or another, to be employed on most street classifications. This NTMCP is reproduced in the next several sections.

Introduction

One of the most persistent and emotional complaints that the City of Norman receives is speeding on residential streets. Each year, there are numerous requests received by City council members and other City administration and staff to "do something" on certain streets where residents have concerns about excessive traffic speeds and/or traffic volumes. Proper street design is essential in encouraging lower speeds, minimizing cut-through traffic, and maintaining the integrity of residential neighborhoods. Through the City platting and development process, new subdivisions are now being designed to avoid long straight stretches of streets which encourage higher speeds. It is on the long stretches of existing streets that most of the speeding complaints are being generated. This report presents a ***Neighborhood Traffic Management and Calming Program*** aimed at making existing residential streets safer and more liveable. Historically, issues of speeding and cut-through traffic could only be addressed through educational efforts, beefed-up police enforcement, and the unwarranted use of regulatory signs;

now, however, physical calming devices have been developed for use when education and enforcement endeavors have failed.

Historical Research

Traffic calming is the combination of both policies and implementation measures that help mitigate the negative impacts to residential streets and neighborhoods caused by motor vehicles. Although traffic calming techniques did not begin to be readily implemented in the United States until the 1980's, there are many examples that have existed for many years in other countries. In Europe and Australia, some of these same techniques even preceded the 1970's. Many of the successful techniques used there are into their second and third generations. Their effectiveness has been proven and many appear to be part of the original street design rather than retrofits.

Traffic calming techniques were developed to reduce speeding problems and heavy flow on residential streets. By making some residential streets more "calm," it makes the neighborhood more liveable. Although "liveable" in terms of a neighborhood does not have a precise definition, feeling safe and secure, interacting with neighbors, and experiencing a sense of home and community identification are certainly some of the characteristics. In essence, when citizens call to request a STOP sign to slow traffic on their street, they are requesting the City to make their street more liveable.

Research has shown a common theme among cities with traffic calming or management programs: there is no single measure, such as STOP signs or speed humps, for solving all traffic problems. Each location has its own unique set of problems that must be analyzed to identify solutions. For this reason, the City of Norman, like several other communities, has developed an extensive toolbox of traffic management and calming tools for customizing solutions.

Classification of Streets

City of Norman streets are classified by their function into three major categories: arterial, collector, and local. These categories are defined as follows:

Arterial: These streets provide for through traffic movement over long distances such as across the city with some access to abutting property. These streets are typically the widest and have the highest speed limits of all of the streets within the city. Within the City of Norman, most arterials have a speed limit of 40 mph or higher.

Collector: These streets provide the connection between arterials and local streets. There is often direct access to abutting properties. These streets provide for medium distance trips such as between neighborhoods. They also collect traffic from the local streets and channel it to the arterial system. Within the City of Norman, most collector streets have a speed limit of 25 mph.

Local: These streets provide for direct access to the residences and for short distance or local traffic movements. Within the City of Norman, most local streets have a speed limit of 25 mph.

Since each city street has an intended purpose related to moving traffic and serving the adjacent land use, the NTMCP must ensure that traffic management measures are compatible with those purposes. Because the installation of calming devices can result, directly or indirectly, in drivers shifting to use an adjacent street as their new route, this is appropriate only if that adjacent street is suitably classified and able to accommodate this traffic. Accordingly, while the majority of traffic management measures in the calming toolbox are appropriate for use on local streets and collectors, fewer (if any) are appropriate on arterials.

Definition of Traffic Calming

In its August 1999 report, “Traffic Calming – State of the Practice,” the subcommittee on traffic calming of the Institute of Transportation Engineers (ITE) defines traffic calming as follows:

Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.

In explaining its definition, the ITE subcommittee distinguishes traffic calming from route modification, traffic control devices, and streetscaping. Traffic calming measures rely on the laws of physics rather than human psychology to slow down traffic. Route modification measures, such as street closures and turn restrictions, do not change driver behavior (i.e. speed), but simply modify driver routing options. Traffic control devices, notably STOP signs and speed limit signs, are regulatory measures that require enforcement. Street trees, street lighting, striping, and other streetscape elements, while complementary to traffic calming, do not directly compel drivers to slow down. By contrast, engineered traffic calming measures are intended to be self-enforcing.

Objectives

The overall objectives for the NTMCP are:

- To implement measures, either physical or psychological, that will reduce speeding and affect driver behavior to improve the liveability and quality of life in residential neighborhoods;
- To preserve and enhance pedestrian and bicycle access to neighborhood destinations;
- To encourage citizen involvement in neighborhood calming and, in the process, provide an opportunity for neighbors to interact and create a positive community atmosphere; and
- To make fair and efficient use of City resources in prioritizing projects to balance the needs of the neighborhood with that of the entire community.

Traffic calming techniques work best when incorporated into a neighborhood traffic management program. Successful programs include good traffic data collection, a thorough planning process, community participation, and local authority support. Because residents are the main initiators of traffic calming requests, they need to be part of the process as much as possible.

Neighborhood Traffic Calming Process

Step 1 – Reporting the problem (Initial Contact)

Upon initial contact made by a resident, property owner, or homeowners association, inquiring about traffic calming in a neighborhood, City staff will mail to the requester an information packet that describes the traffic calming program, application process, and the criteria used to establish eligibility. After reading the information, if residents are still interested in the program, they must write out a formal request and return it to the City. The purpose of this written request is to initiate the NTMCP process and to formally request a traffic study be conducted to see if the neighborhood meets the NTMCP criteria; it is not a petition for traffic calming measures (that comes later in the process). The written request requires a written description of the residents' concerns and requires signatures from residents of at least four (4) different households in the impacted area that share the same traffic concerns.

Step 2 – Traffic Study

Upon receipt of a formal written request by a neighborhood, the City Traffic Control Division will schedule a traffic study in the neighborhood. Traffic studies are usually conducted during the school year unless unique circumstances, as determined by the City Traffic Engineering staff, exist. To be eligible to participate in the NTMCP, certain speed and traffic volume criteria must be met.

Step 3 – Pre-Calming Measures

If the trouble location meets the speed and volume criteria, City staff will first suggest possible solutions that do not involve the use of physical controls or impediments on the street. These include:

- Traffic Signing and Pavement Markers - Traffic Engineering staff will review all of the traffic signing and pavement markers in the area. If necessary, staff will install additional signing and striping.
- Traffic Enforcement Actions - The traffic data study will include raw counts of traffic volumes and vehicle speeds over a 72-hour period and will categorize these numbers into the time of day that they occurred. This data will be forwarded to the Norman Police Department for their increased patrol visibility and more strategic enforcement efforts.
- Radar Speed Trailer Deployment - This is a temporary device that is primarily used to educate motorists regarding the fact that they may be exceeding the posted speed limit.

Step 4 - Follow-up Data Collection

If one or more of the Pre-Calming Measures is implemented, the City Traffic Control Division will wait approximately three to six months and then collect additional speed/volume data. The new data will be analyzed to determine if the Pre-Calming Measure was successful. If the measure was successful in terms of bringing the numbers below the criteria thresholds, then the process will end at this point. If the measure was not successful, i.e. the location continues to exceed speed/volume thresholds, City staff will move on to explore the more self-enforcing types of traffic calming devices.

Step 5 - Presentation of Specific Traffic Calming Plan

If the results of the traffic studies still indicate that the neighborhood meets the NTMCP criteria, a meeting with residents in the neighborhood will be held by City staff. At this meeting, City staff will discuss the NTMCP process, give a brief summary about traffic calming devices previously tried in the City of Norman and in other communities, show the results of the traffic studies, present a Specific Traffic Calming Plan for the neighborhood, and solicit residents' input for modifications to the plan. Although residents not living directly on a potentially "calmed" street would not vote on a support petition for a traffic calming project, they may have an indirect interest and should be invited to this neighborhood meeting where the traffic calming plan is presented and discussed.

Step 6 - Petition Process

After the public meeting, and with original or modified Specific Traffic Calming Plan agreed upon, City staff will prepare a petition to be signed by residents and business owners adjacent to and surrounding the street being "calmed." A map showing the location of the traffic calming measures and the petition boundary area will also be included. This petition must document that at least 60% of all households and businesses within the petition boundary area support the Specific Traffic Calming Plan. All properties within the affected area must be accounted for (either with signature in support of plan, or without signature in opposition to plan) or by written statement by circulator why a specific property was not represented. Only one signature per household is allowed. Petitions must be completed and returned to the City within one (1) year from the date they were provided to the neighborhood coordinator or they will expire.

Petition Eligibility

Residences either fronting or otherwise directly adjacent to the street containing the calming devices will be eligible to sign the support petition for the calming project. Recognizing that every neighborhood is configured differently and that the impact of a calming project is more direct for those residents along the corridor itself, City staff will look for opportunities, such as including residents on intersecting cul-de-sacs, to expand the voting area allowed on the support petition. For a device placed in an intersection, such as a traffic circle, residences within a 300' radius of such device will also be eligible to sign. Signers can be either the property owner or his/her agent. Renters can sign, but with the understanding that the property owner could possibly reverse his/her tenant's vote. City staff will make reasonable effort to find and contact local property owners during the verification process, but will accept the renter's signature if proof of residency via utility record or other official document can be verified. The signature of any official representative of a business, church, school, homeowner's association clubhouse, etc. will be accepted for non-residential petitioners. Only valid petitioners, as described above, will be allowed to register petition support. 60% of eligible petitioners is necessary to support a calming project containing calming devices.

Step 7 - Implementation and Funding

Having verified the signatures on the petition, City staff will finalize traffic calming plans, prepare cost estimates, and enter into an agreement with a contractor to perform the work. Upon completion of work, City crews will install striping and signing. Traffic calming projects are funded primarily from public funding; however, when public funds are not available, private

funding is a possibility. Any private funding must be collected on a volunteer only basis and presented to the City of Norman prior to construction.

Step 8 - Follow-up Evaluation

When construction of a traffic calming project is totally finished, the City Traffic Control Division will conduct a final traffic study to evaluate the effectiveness of the calming device(s). Additionally, City staff will send out a Feedback Survey to neighborhood residents as part of the evaluation process.

Step 9 - Landscaping

Landscaping of areas created by traffic calming, if needed, will be the responsibility of the neighborhood involved. City staff will prepare a Landscaping Agreement setting forth requirements and guidelines for the homeowners association, or other neighborhood group, accepting responsibility for the landscaping and its future maintenance. Hook-ups for utility services (e.g. water and power) may be provided in the construction phase of the project to facilitate maintenance efforts, but metering of utilities shall be initiated and paid for by the neighborhood group responsible for landscaping and its maintenance in compliance with City of Norman regulations and permits.

Qualifying Criteria

To qualify for the NTMCP, a neighborhood residential street must meet the following minimum criteria:

- 85th Percentile Speed of vehicles on roadway > 8 mph over posted speed limit and
- Average Daily Traffic (ADT) > 600 vehicles/day (vpd).

If number of reported speed-related accidents in 3-year period > 5 accidents, this can be used as a substitute criterion in lieu of either the speed or volume requirement. It is important to recognize that special circumstances, including lack of sidewalks or proximity to parks or schools, in some neighborhoods may justify lower qualifying thresholds. These neighborhoods may be considered for the more permanent, self-enforcing type devices, but still must meet the following minimum criteria:

- 85th Percentile Speed of vehicles on roadway > 7 mph over posted speed limit and
- Average Daily Traffic (ADT) > 500 vehicles/day (vpd).

NOTE: 85th Percentile Speed is that speed below which 85% of all traffic units travel. It is an accepted principle that the majority of drivers on a roadway select safe and proper speeds based on roadway and traffic conditions. For determining a speeding problem on a specific roadway, the 85th percentile speed is often used because it is on the high end of a “normal” bell curve distribution. Typically, recorded speeds above the 85th percentile occur much less frequently than the speeds below it because the highest speeds are often erroneous readings or the result of a few drivers who are either unperceptive of roadway conditions or irresponsible. The generally accepted traffic engineering practice is to set speed limits at the nearest increment to the 85th percentile speed unless other considerations such as accidents and real dangers not perceivable

by drivers may indicate the need for a lower speed limit. Since speed limits are generally set using the 85th percentile, it is expected that 15% of the vehicles will exceed the speed limit on a regular basis.

Excluded Routes

The use of certain traffic calming devices will be restricted on public transit routes. Devices of the speed hump genre will not be used on these routes.

On routes designated as “emergency routes” by emergency responders such as the Fire Department and ambulance services, only “drive around” type traffic calming devices, such as traffic circles and offset (divided) speed tables, will be allowed. These routes are those on which calming devices would delay emergency responders from meeting their target response times.

Prioritization of Projects

For the purpose of prioritizing projects competing for traffic calming dollars, points are assigned based on the following point system:

No. of mph that the qualifying 85th Percentile Speed is over posted speed limit:

- > 8 to 10 mph = 6 points
- > 10 to 12 mph = 7 points
- > 12 to 14 mph = 8 points
- > 14 to 15 mph = 9 points
- > 15 mph = 10 points

If no. of mph that the 95th Percentile Speed is over posted speed limit:

- > 15 mph = 5 points

Average Daily Traffic (ADT):

- > 600 to 900 vehicles per day (vpd) = 3 points
- > 900 to 1,100 vpd = 4 points
- > 1,100 to 1,500 vpd = 5 points
- > 1,500 vpd = 6 points

No. of reported speed-related accidents (last 3-year period):

- 0 – 1 = 1 point
- 2 – 3 = 2 points
- 4 – 5 = 3 points
- 6 – 10 = 5 points
- > 10 = 7 points

Pedestrian generators (only 1 category per project):

School in petition area = 4 points

Hospital in petition area = 3 points

Park or non-home day care center on street = 2 points

Other (shopping, convenience store, church, commercial business) on street = 1 point

No sidewalks on both sides of street = 2 points (max.)

Overwhelming neighborhood petition support:

> 90 % = 1 point

Competing projects are ranked according to their sums of the above assigned points. Projects not funded may be considered for the next funding cycle, but will have to undergo the prioritization process again.

Impacts of Traffic Calming Devices

Overall Effectiveness –

The physical actions of calming devices are almost always successful (to varying degrees) in forcing traffic to behave in an intended fashion. In most cases, these devices can achieve the desired result by utilizing a one-time capital expenditure and very low ongoing maintenance costs.

Effect on Emergency Vehicles Response Times –

Creating bumps, dips, and sharp curves is precisely the objective being sought by many of the calming devices and, of course, these maneuvers can negatively impact emergency vehicles response times. It is believed, however, that these delays are minimal and, in most situations, can be tolerated. Quantitatively, research shows that both vertical and horizontal displacement devices can delay ambulances and fire trucks from 2 to 10 seconds per device. It is important in the engineering of these devices that locations and sizes of these types of devices be carefully considered to mitigate such delays. Where applicable, “test” runs of emergency vehicles will be made before installation of permanent devices.

Loss of Parking –

It is often necessary to prohibit on-street parking in the immediate vicinity of certain traffic calming devices in order to accommodate the realigned vehicle path. In these cases, the adjacent residents should be aware that a loss of on-street parking in front of their residences will occur.

Aesthetic Impacts –

While some traffic calming devices can have favorable aesthetic impacts and enhance neighborhoods when beautifully landscaped, others can be, by their nature, somewhat unsightly. Some devices (e.g. speed humps) most often pose no opportunity for the incorporation of aesthetics and could actually have negative visual impacts. In fact, virtually all traffic calming actions require signs, striping, and reflective devices which may not be construed as aesthetically pleasing to all residents. In the end; however, most residents feel that this is a minor trade-off for the calming benefits they are receiving.

Removal of Traffic Calming Devices

Devices installed for the purpose of calming traffic in residential areas may be removed or significantly modified only when all of the following criteria have been met:

- At least 75% of the residents and/or property owners (one signature per residence) living within 600' of the device in question must agree, by petition, to remove it.
- The calming device must have been in place twelve months or longer before being considered for removal.
- The City Traffic Engineer agrees that its removal will not affect the overall effectiveness of the calming efforts in the neighborhood.
- Funding, either from City or private residential sources, must be available to restore or modify the device.

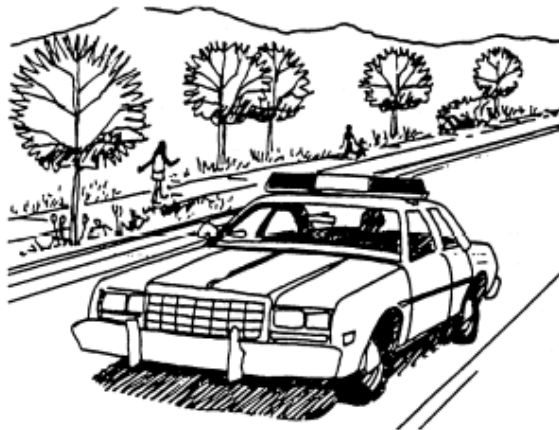
Description of Traffic Management and Calming Tools

1. ***Police Presence in Neighborhood*** (see Figure 1)

Positioning of a police vehicle on a street as a visible means of enforcement to discourage speeding.

Figure 1

<i>Police Presence in Neighborhood</i>	
Advantages	Disadvantages
Shows an enforcement presence	City resources needed to deploy units
Drivers may slow down fearing enforcement	Residents quickly realize that mere presence of police does not result in speeding citations



2. **Police Enforcement** (see Figure 2)

At the request of the Traffic Control Division, the Norman Police Department deploys a radar enforcement unit to issue citations in a neighborhood during certain strategic times to discourage speeding.

Figure 2

Police Enforcement	
Advantages	Disadvantages
Visible enforcement reduces speeding	Benefits are usually short term
Driver awareness about speeding is increased	
Enforcement flexible - any time of day	
Effect can be quick	

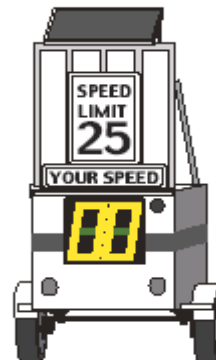


3. **Radar Trailer** (see Figure 3)

A non-enforcing, temporary measure to increase driver awareness about speeding in which a portable radar speed meter mounted beside a street measures vehicle speeds and displays speed on a board.

Figure 3

Radar Trailer	
Advantages	Disadvantages
An effective public relations and educational tool	Not an enforcement tool
Usually effective where radar trailer is located	Benefits are usually short term



4. *Neighborhood Radar Monitoring* (see Figure 4)

A hand-held radar gun is made available, with instructions provided by City staff, to certain trained residents to determine the amount of speeding and who is speeding in the neighborhood.

Figure 4

Neighborhood Radar Monitoring	
Advantages	Disadvantages
Effect on speeders limited to sight distance of radar gun	Not an enforcement tool
An effective public relations and educational tool	Requires training
Neighbors feel they are part of the solution	
Possibility of long-term effects as residents interact with each other	



5. *Automated Speed*

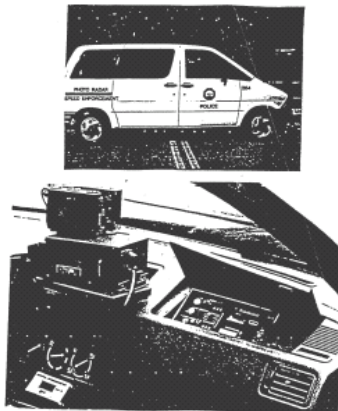
Enforcement (see

Figure 5)

A street installation of a camera and radar determines if a car is exceeding the speed limit, takes a picture of vehicle's license plate, and a ticket is mailed to the vehicle owner.

Figure 5

Automated Speed Enforcement	
Advantages	Disadvantages
Very effective once public is aware of the automated enforcement	Residents may not like the "Big Brother is watching you" feeling
Cost effective – private companies will install and maintain equipment	May be some legality concerns



6. **Gateway** (see Figure 6)

A special entrance feature to a neighborhood that narrows a street at its entrance and includes a sign and landscaping, and sometimes a median and a change of pavement texture.

Figure 6

Gateway	
Advantages	Disadvantages
Creates an identity to a neighborhood	Increased maintenance costs
Creates added streetscape area for landscaping or monuments	Can impede legitimate truck movements
Discourages truck entry	

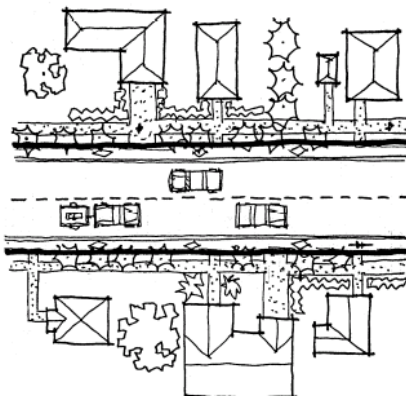


7. **Striping Narrow Lanes** (see Figure 7)

A measure by which pavement striping is used to create narrow 10 foot wide lanes to give drivers a feel of a narrower street that does not lend itself to high speeds.

Figure 7

Striping Narrow Lanes	
Advantages	Disadvantages
Changes can be quickly implemented	Increases regular maintenance
Striping can be easily modified	Residents don't perceive as a speed control tool
Speeds decreased and safety improved by positively guiding drivers	

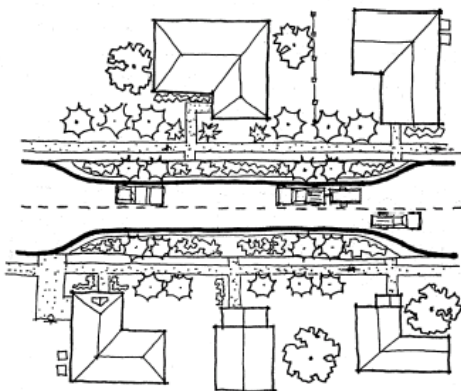


8. *Choker / Choker Island* (see Figure 8)

A modification of an existing curb section (or a stand alone landscape strip beside the existing curb) that “chokes” or reduces the street width at an intersection, mid-block, or other street segment to slow down traffic.

Figure 8

<i>Choker / Choker Island</i>	
Advantages	Disadvantages
Slight slowing is normal result	Potential object for motorist to run into
Shorter pedestrian crossing distances	May impede bicycle mobility and safety
Creates added streetscape area for landscaping	Can impede legitimate truck movements
Can discourage truck entry	May require drainage modifications

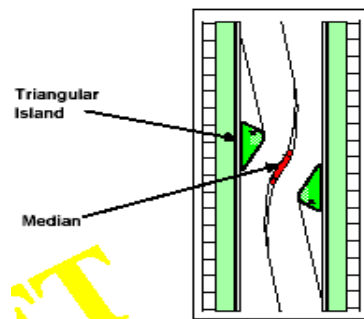
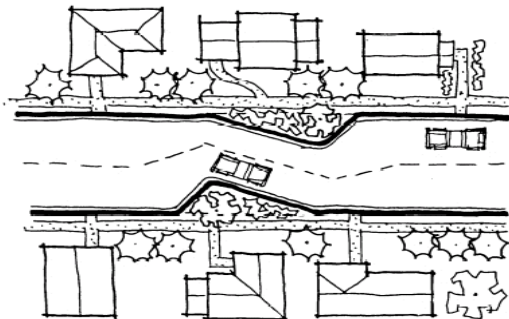


9. *Angled Slow Points* (see Figure 9)

A modification of an existing curb section that is used in conjunction with another one, slightly offset, on the opposite side of the street to create a narrow, angled path that makes oncoming traffic want to yield and thus slow down.

Figure 9

<i>Angled Slow Points</i>	
Advantages	Disadvantages
Reduces vehicle speeds	Loss of on-street parking
No significant impedance to emergency vehicles	Regular landscaping maintenance needed
Creates added streetscape area for landscaping	Potential for head-on collisions

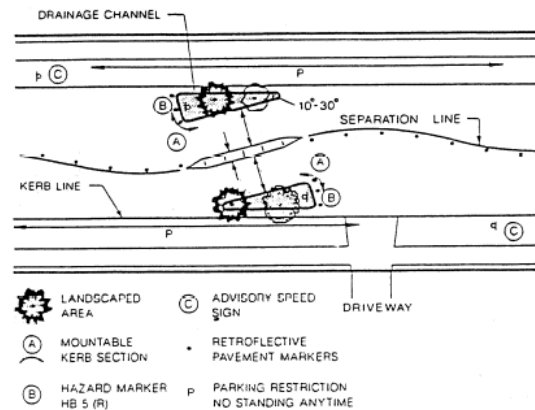


10. *Divided Angled Slow Points* (see Figure 10)

A modification of an existing curb section that is used in conjunction with another one, slightly offset, on the opposite side of the street, and with a center island, to create a narrow, angled path that slows down vehicles.

Figure 10

<i>Divided Angled Slow Points</i>	
Advantages	Disadvantages
Reduces vehicle speeds	Loss of on-street parking
No significant impedance to emergency vehicles	Regular landscaping maintenance needed

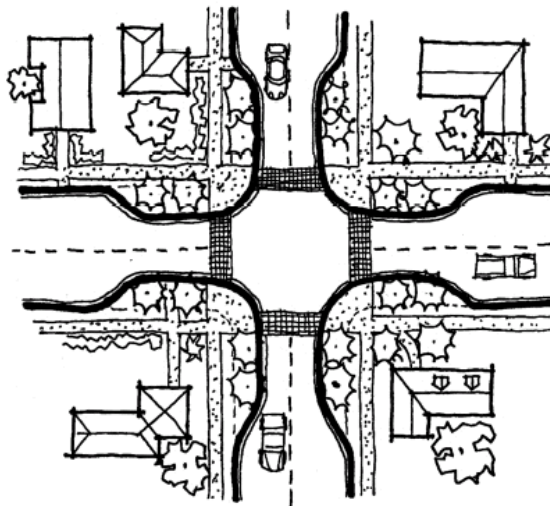


11. *Neckdowns (Curb Bulb-outs)* (see Figure 11)

A modification of existing curbs at intersections that reduces street width to slow down traffic and shortens pedestrian crossing distances.

Figure 11

<i>Neckdowns (Curb Bulb-outs)</i>	
Advantages	Disadvantages
May be aesthetically pleasing if landscaped	Increased landscaping maintenance
Shorter pedestrian crossing distances	Landscaping could cause sight triangle problems

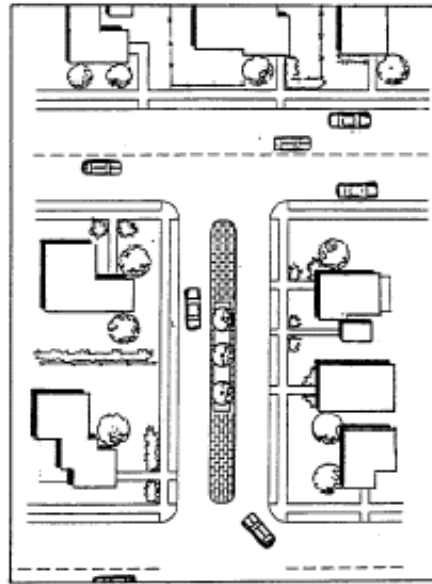


12. *Center Island Median* (see Figure 12)

A curbed stand alone strip, usually landscaped, placed in the middle of a street as an “island” that divides traffic into narrower lanes to slow down the vehicles.

Figure 12

<i>Center Island Median</i>	
Advantages	Disadvantages
Reduces opportunities for head-on accidents	Loss of on-street parking
May be aesthetically pleasing if landscaped	Can restrict certain convenient turns

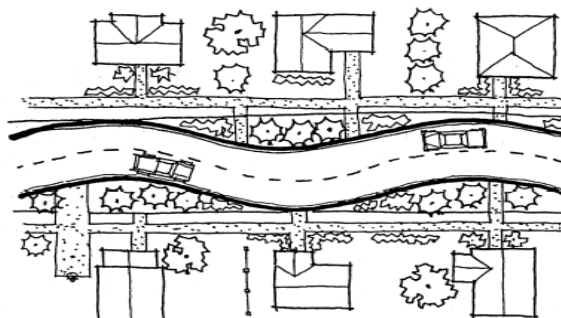
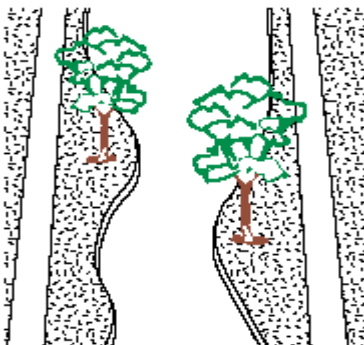


13. *Chicane (Serpentine)* (see Figure 13)

Long, realignment modifications of street curbs that alternate from one side of the street to the other, creating S-shaped curves that discourage speeding in order to navigate.

Figure 13

<i>Chicane (Serpentine)</i>	
Advantages	Disadvantages
Reduces vehicle speeds	Increased landscaping maintenance
May reduce through traffic volumes	Significant loss of on-street parking
	Emergency vehicles mildly effected

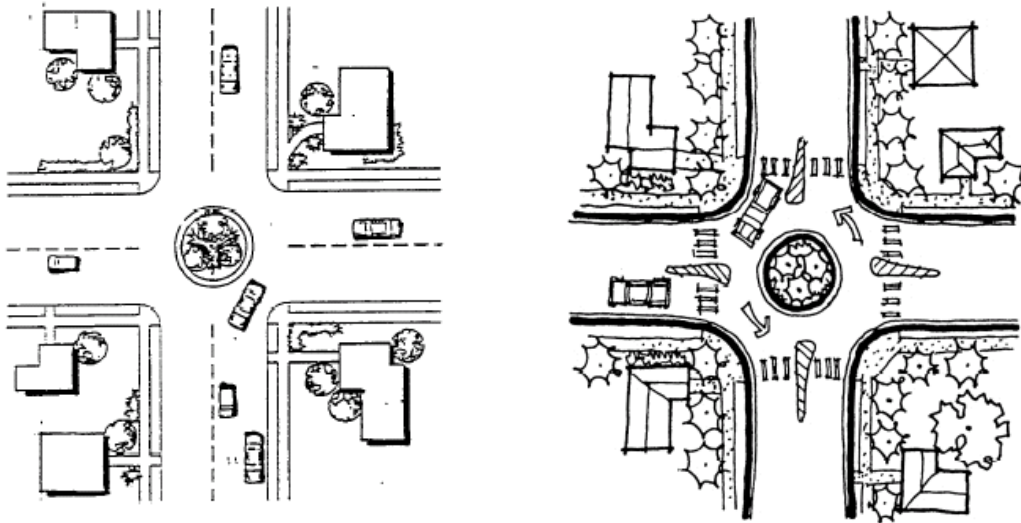


14. **Traffic Circle** (see Figure 14)

A circular, raised island, usually landscaped, placed in an intersection to prevent speeding through the intersection by impeding straight through movements and forcing drivers to slow down to go around it.

Figure 14

Traffic Circle	
Advantages	Disadvantages
Noticeable reduction of speeds	May increase accidents until drivers used to it
Aesthetically pleasing when landscaped	Pedestrians/bicyclists must adjust change of crossing patterns

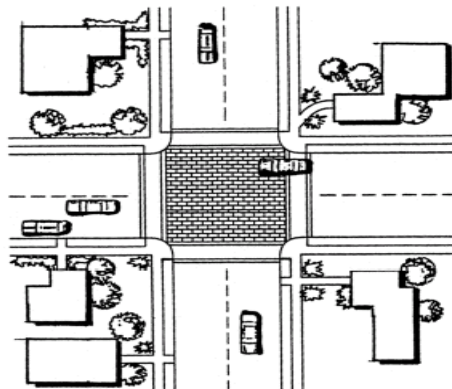


15. **Raised Crosswalk** (see Figure 15)

A raised plateau of roadway, usually installed at a street intersection, vertically deflects vehicles causing traffic to slow down, and enhances pedestrian safety.

Figure 15

Raised Crosswalk	
Advantages	Disadvantages
Effective speed reduction	Affects emergency vehicle response time
Can be aesthetically pleasing	Expensive to construct and maintain
Improves pedestrian safety	Could cause drainage problems

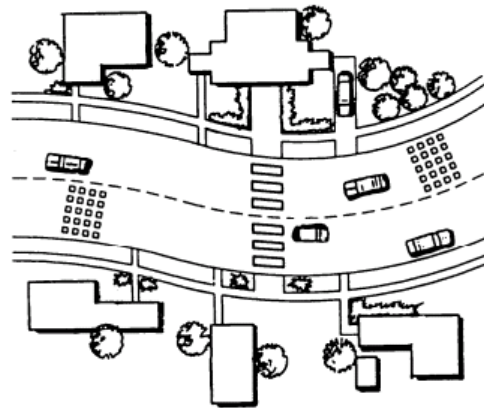


16. *Rumble Strips* (see Figure 16)

“Dots” or rough strips glued to pavement causing tire “rumble” that alert drivers to heighten their awareness by slowing down.

Figure 16

<i>Rumble Strips</i>	
Advantages	Disadvantages
Driver's attention alerted to heighten safety	High noise level for adjacent residents
Slight speed reduction	Regular maintenance needed
Low cost installation	

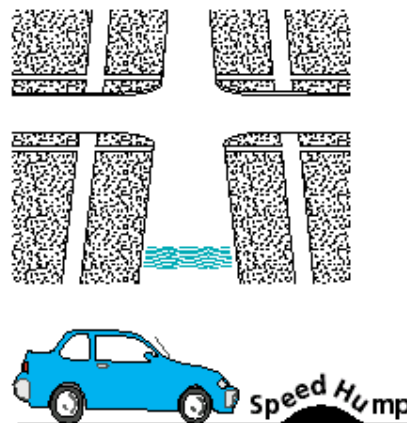


17. *Speed Humps* (see Figure 17)

14' long parabolic shaped mounds of paving or pre-fabricated material placed across a roadway that causes a vertical shift in a crossing vehicle resulting in its driver slowing down.

Figure 17

<i>Speed Humps</i>	
Advantages	Disadvantages
Effective speed reduction	Affects emergency vehicle response time
Can shift cut-through traffic elsewhere	Jars vehicles
	May be increased noise

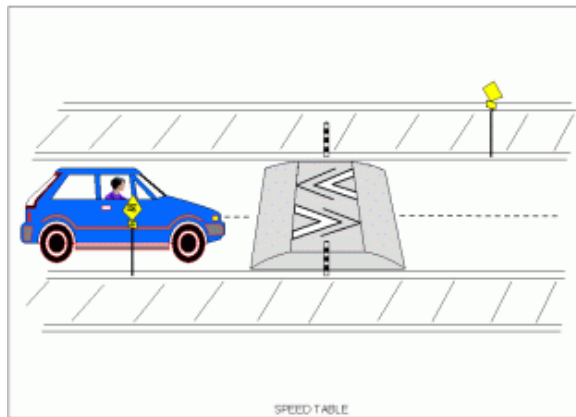


18. **Speed Tables** (see Figure 18)

22' long raised mounds of paving or pre-fabricated material, consisting of a flat middle section and parabolic end sections, placed across a roadway that cause a vertical shift in a crossing vehicle resulting in its driver slowing down.

Figure 18

Speed Tables	
Advantages	Disadvantages
Effective speed reduction	Affects emergency vehicle response time
Can shift cut-through traffic elsewhere	Jars vehicles
	May be increased noise

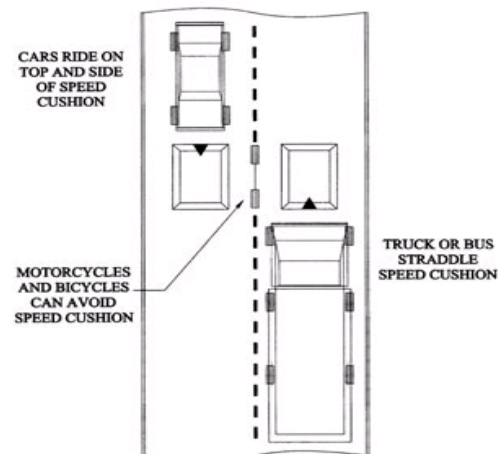


19. **Speed Cushions** (see Figure 19)

10' long mounded sections of pre-fabricated material placed across the roadway and spaced approximately 3' apart that cause a vertical shift in a crossing vehicle resulting in its driver slowing down.

Figure 19

Speed Cushions	
Advantages	Disadvantages
Effective speed reduction	Jars vehicles
Can shift cut-through traffic elsewhere	May be increased noise
	Not too aesthetic

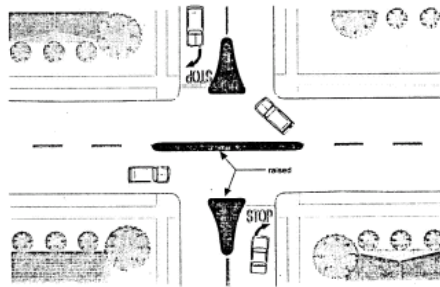


20. **Turn Restriction Barrier** (see Figure 20)

A physical barrier constructed in the form of a concrete median barrier, closely-spaced row of flexible delineator posts, or, simply delineators glued to the pavement surface that is installed to prevent vehicles from making certain movements in and out of residential streets.

Figure 20

Turn Restriction Barrier	
Advantages	Disadvantages
Intersections safer by reducing number of conflicting movements	Little speed reduction
Can reduce traffic volumes and accidents	Gives residents fewer turning options

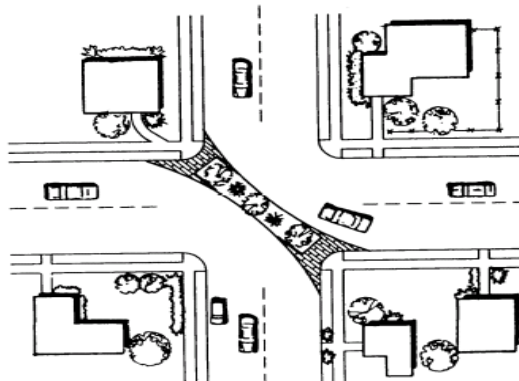


21. **Diagonal Diverter** (see Figure 21)

A physical barrier between diagonally opposite corners of a four-legged intersection, thus creating two unconnected L-shaped intersections for the purpose of reducing speeds and diverting traffic elsewhere.

Figure 21

Diagonal Diverter	
Advantages	Disadvantages
Reduces speeds and volumes	Can shift volume problems elsewhere
Reduces accidents by reducing number of conflicting movements	Gives residents fewer path options
Has lesser impact on traffic circulation than complete street closure	

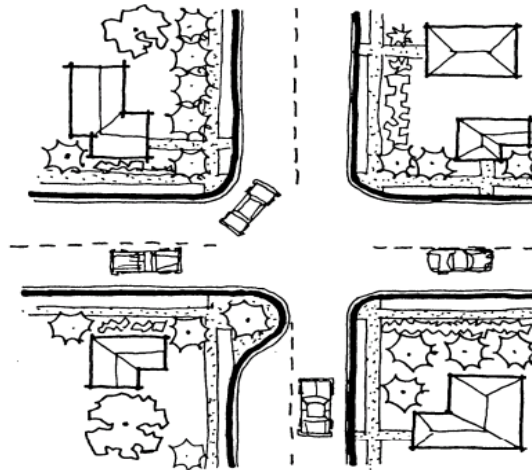


22. *Half Closure (Semi-Diverter)* (see Figure 22)

A partial street closing effectuated by a significant curb extension or bulb-out at an intersection that physically prevents a straight through movement of traffic across the intersecting street.

Figure 22

<i>Half Closure (Semi-Diverter)</i>	
Advantages	Disadvantages
Reduces cut-through traffic	Increased landscaping maintenance
May reduce traffic speeds	Easy to go around, especially at night

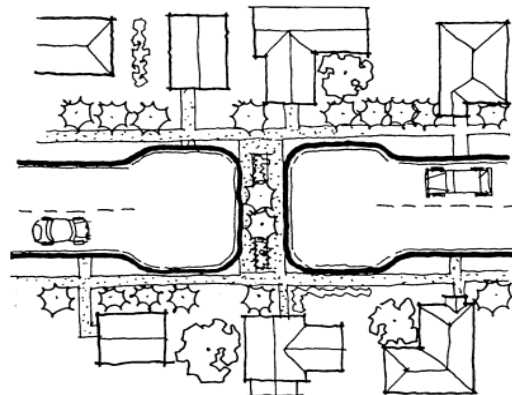


23. *Mid-Block Road Closure* (see Figure 23)

Back-to-back cul-de-sacs created by closing a street mid-block using a landscaped area for the purpose of reducing speeds and eliminating through traffic.

Figure 23

<i>Mid-Block Road Closure</i>	
Advantages	Disadvantages
Eliminates cut-through traffic	Can shift volume problems elsewhere
Reduces speeds in vicinity of closure	Increased landscaping maintenance
	Impedes emergency access
	Loss of on-street parking

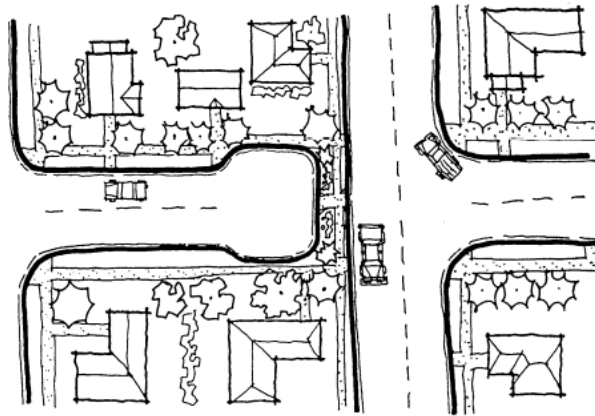


24. **Complete Road Closure** (see Figure 24)

A street closure created by a landscaped area at the end of a block, formed as a cul-de-sac for turn-around purposes, to prevent cut through traffic and to virtually eliminate speeding on closed street.

Figure 24

Complete Road Closure	
Advantages	Disadvantages
Eliminates speeding traffic	Impedes emergency access
Effective volume reduction	Gives residents fewer path options
Can be aesthetically pleasing when landscaped	Can shift volume problems elsewhere
Safer for children	

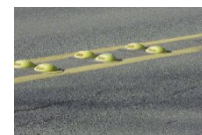
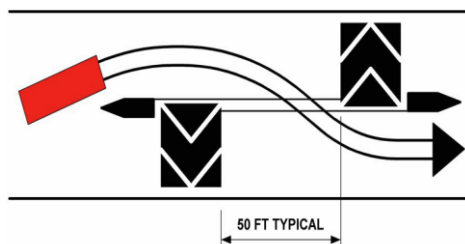


25. **Offset (Divided) Speed Table** (see Figure 25)

A pair of 22' long raised mounds of paving, separated so that emergency vehicles can go around them, each consisting of a flat middle section with parabolic end sections and placed in opposite direction lanes so as to cause a vertical shift in a crossing vehicle resulting in its driver slowing down.

Figure 25

Offset (Divided) Speed Table	
Advantages	Disadvantages
Effective speed reduction	Jars vehicles
Can shift cut-through traffic elsewhere	May be increased noise
Minimal delay for emergency vehicles	
Emergency vehicles can go around tables	



GENERAL POLICY GUIDANCE

TORT LIABILITY

The low speed environment of a traffic calmed street is a difficult place for someone to be “victimized” by a fault in the road design. Consequently, there are fewer tort actions associated with traffic calming. Furthermore, there are generally fewer collisions and injuries and deaths on traffic calmed streets than streets with higher speeds.

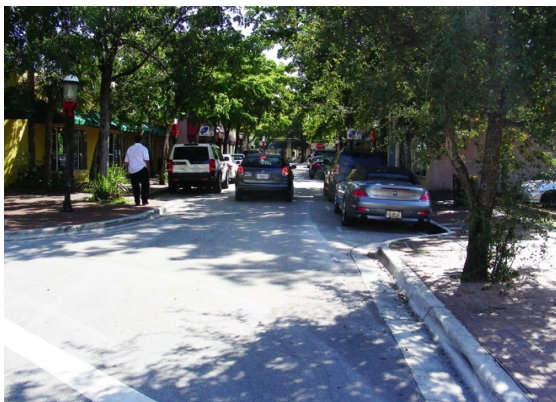
TRAFFIC CALMING CONTEXTS

Early traffic calming efforts in North America started as “programs” and often used a variety of warrants and petitions. However, traffic calming has evolved and there are many reasons to calm traffic; a city doesn’t need special permission or warrants to increase the safety and comfort of its streets. In many ways, traffic calming is synonymous with other terms that are used to encourage better street designs. Depending on the term, the emphasis differs, but in all cases traffic calming measures play a role. This is especially the case with new construction.

Context-Sensitive Design (CSD)

CSD implies that the context (i.e., the social, historical, physical, fiscal, political, environmental, and policy contexts) drive the design as opposed to the conventional street hierarchy. Typically, conventional practices use general design guidelines that are indifferent to the context. Frequently, contexts along conventional streets in cities suffer from some combination of negative effects of motor vehicle use, poor driver behavior, and poor conditions for non-motorized street users. Consequently, CSD often employs traffic calming measures to respect the context of the street and neighborhood.

Complete Streets



Complete street (Credit: Ryan Snyder)

The term “complete streets” describes streets that comfortably accommodate all users of the street, with emphasis on pedestrians, cyclists, and transit users, as well as people of all ages and physical abilities. These users are more exposed and affected by the street environments than motor vehicle users. Furthermore, their comfort has been routinely ignored by conventional and automobile-oriented design. Often, traffic calming measures are used to provide comfortable accommodation as opposed to technical accommodation.

By adopting a complete streets policy in Norman, this requires that:

- When major reconstruction occurs, conventional streets be altered into complete streets as the standard operating procedure
- New streets be built as complete streets

Traffic calming measures help to implement these policies.

Smart Transportation

This term describes the transportation aspects of smart growth. The idea is to consider “transportation planning and design” as integral with “land use planning and design,” as opposed to separate ideas. Too often, the two are done by separate specialists and for independent reasons. Traffic calming measures play an important role in the design of all scales of streets in cities when integration with the adjacent land use is desired.

Safe Routes to School

Safe Routes to School includes a series of operational and physical changes that help students walk and cycle to and from schools. Traffic calming measures are routinely employed with other strategies and changes to create safer walking and bicycling routes to school by slowing traffic.

Neighborhood Traffic Management

This term describes the combination of:

- Route modifications (e.g., turn prohibitions, closures, partial closures, diverters, and one-way streets) to remove parts of the street network, sever linkages, create mazes, or reduce connectivity
- Unwarranted traffic control devices (e.g., STOP signs and traffic signals) to annoy or delay motorists who cut through neighborhoods
- Traffic calming to reduce poor driver behavior (e.g., speeding and aggressive driving)

Please note that in most situations, diminishing the street network is not considered good practice. Bicycle boulevards are a primary exception to this rule; traffic control devices are desirable on bicycle boulevards to discourage through motor vehicle traffic. Route modification may also be used to reduce cut-through traffic where the traffic will be diverted to a boulevard.

Road Diet

This term describes the narrowing and/or removal of motor vehicle lanes from the cross-section. Both of these changes are traffic calming measures. Typically, the reclaimed space is used for other purposes such as wider sidewalks, landscaped spaces, bicycle lanes, linear parks, and/or on-street parking. Often, road diet projects employ other traffic calming measures as well. Roundabouts often enable implementation of road diets, especially on busier boulevards since they have greater capacity to handle traffic at intersections with fewer lanes than other controls.

Competent Street Design



*Curb extensions enhance retail districts:
Asheville, North Carolina (Credit: Ryan Snyder)*

Competent street design combines all of the above. There is little excuse any more to ignore the context or to build incomplete, dangerous, or poorly integrated streets. The issue for traffic calming is not justification but prioritization. If there are problems with a conventionally designed street, then traffic calming is warranted. This is precisely why the City of Norman's historic traffic calming program is neighborhood driven. The questions are how to calm, when to calm, and how the project compares to other priorities in the city.

Obviously, an early priority for any city is to incorporate traffic calming measures into normal street design practices and procedures to help any new/future streets avoid the deficiencies of conventionally designed streets. The City of Norman's CTP contains a variety of cross-sections applicable to most road types. The harder part is prioritizing the rebuilding or retrofitting of the myriad of already built conventionally design streets. Rebuilding or retrofitting these streets should be prioritized based on the context, in the broadest sense.

Traffic Calming and Stormwater Management

Traffic calming measures, such as bulb-outs, roundabouts, traffic circles, chicanes, lane narrowing, and others, can be used as stormwater management tools. Some of these can create space for bioretention, detention, and pervious pavement.

PLANNING AND DESIGN PROCESSES

Traffic calming should be a normal part of any city's planning and design processes. The processes will vary dramatically depending on the context. For example, implementing a road diet in conjunction with a transit facility along a five-mile arterial would require a different process than reverting one-way streets back to two-way operation in a downtown. Similarly, a neighborhood traffic calming plan would require a different process than designing a people-friendly Main Street. Also, identifying arterial streets that are barriers in a city during comprehensive planning would require a different process than altering streets on a college campus or hospital campus.

The common threads that link all of the processes include the following:

- Gaining a good understanding of the context
- Involving the stakeholders in the definition of the problems to be solved and aspirations to be fulfilled
- Educating the stakeholders such that they can have meaningful involvement
- Aligning the project with a broader vision for the area
- Achieving an informed consent regarding the plan

Traffic calming is best done in conjunction with a development, revitalization, utility, or maintenance project; a downtown, corridor, or transit plan; a new street design; or other project. Then the traffic calming layer is simply incorporated into the larger project's processes.

Table 9.1 illustrates acceptable traffic calming measures on various types of streets.

Table 9.1: Representative Examples of Traffic Calming Measures and their Appropriateness on Various Street Categories

Traffic Calming Classification		Framework Street			Framework Street or Non-Framework Street	Non-Framework Street
Posted/Design/Target/Operating Speed (mph)		35 mph +	25 to 30 mph	25 mph	25 to 30 mph	25 mph or below
Transition Zone from / to higher speed environment						
Entrance Features (architecture / landscaping / monument)						
Cross-Section Measures	Reduction in number of lanes					
	Reduction in width of lanes					
	Long Median / Continuous Median					
	Short Median / Refuge					
	Short Medians on Curves					
	Bulb-outs					
	Curb and Gutter					
	Curbless / Flush Streets					
	Flush Medians					
	Pedestrian Scale Lighting					
	Street Trees					
	Building up the right-of-way					
	Lateral Shifts					
	Bike Lanes / Protected Bike Lanes / Cycle Tracks					
	Textured and/or Colored Paving Materials (parking, lanes, bike lanes, crossings, intersections, general purpose lanes, turn lanes, medians)					
	On Street Parking	Parallel				
		Back-in-angled				
		Front-in-angled				
		Right-angle				
		Valley gutters used in conjunction with parking				
Periodic Measures	Horizontal Measures	Roundabouts				
		Mini-Roundabouts				
		Mini Traffic Circles				
		Impellers (T-intersections)				
		Two-lane chicanes				
		One-lane chicanes (yield condition)				
		Short Medians				
		Medians on curves				
	Narrowings	Yield Streets				
		Pinch Points				
		Bulb-outs				
	Vertical Measures	Raised intersections				
		Raised crosswalks				
		Flat-top Speed Humps (speed tables)				
		Speed Cushions				
		Speed Humps				
Not Traffic Calming Measures	Vertical	Rumble Strips (for warning purposes)	Rural Only			
	Changes	Speed Bumps				

Note: Many of these measures can be combined in a variety of ways that are too numerous to list in this chart.

Legend:

Appropriate
Appropriate in Specific Circumstances
Not Appropriate

10. STREETSCAPE ECOSYSTEM

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INTRODUCTION

The street is a system: a transportation system, an ecosystem, and a system of social and economic interactions. The idea of a streetscape ecosystem is to mimic nature, building reciprocal relationships within an interconnected system to sustainably enhance the local environment, its resources, the community, and the local economy. To do this, the tools addressed in this chapter should be integrated with the other chapters in this manual.

This chapter is organized based on natural hierarchy. The first section focuses on stormwater management since water is the fundamental ingredient for other components of a streetscape ecosystem. The stormwater management section provides guidance for working with and maximizing beneficial aspects of rain and other sources of water. The second section covers landscaping providing guidance for street designs that include site-appropriate vegetation to maximize environmental and social benefits. Canopy trees provide shade to cool the streets and hardscapes from which the stormwater is harvested. These sheltered micro-climates create ideal locations for people to gather, walk, and bike.

To help cities achieve street designs that create great places fostering community, the end of this chapter address street furnishings, utilities, and lighting. These elements (e.g., sheltered benches, bike racks, and bus shelters) should be placed where people can utilize them. These sections provide guidance as to the placement of utilities and how this coordinates with other streetscape components. The elements described can help attract pedestrians to a street and thereby make the street safer, more dynamic, and more vibrant economically.

PRINCIPLES OF STREETSCAPE ECOSYSTEM DESIGN

Each section in this chapter includes design principles followed by tools to achieve these principles. These streetscape element-specific principles collectively support both the overarching principles of this chapter and the broader goals of this manual. The collective use of the tools in this chapter can provide numerous aesthetic and functional elements in the public rights-of-way, including the entire space between buildings, traveled way, and sidewalks. The following overarching principles should be applied:

- **Coordinate all streetscape elements with traveled way design to maximize ecological, economic, and social benefits.** Individual street projects should not be pursued in a vacuum, but planned as part of a comprehensive strategy. Use street medians, roundabouts, chicanes, curb extensions, and other road configurations as space for people and nature. They provide opportunities for vegetation, stormwater management tools, and other streetscape elements like benches and bike racks.
- **Create a contextualized sense of place.** Using the menu provided in this chapter, select streetscape elements reflecting the context and character of the location as well as support connections to adjacent land uses. The street will function as a shared living room for the community and a welcoming front door for the buildings on the street. Native plantings are used to root the context in surrounding natural landscape while acknowledging local ecosystems and climate.

STORMWATER MANAGEMENT

The street is a constructed waterway, often differing from the natural path of water and disconnected from the hydrologic cycle. Traditional design has focused on speedy removal of water from the street and disposal of it as waste in storm drains and sewers. This section provides tools to reclaim stormwater as a resource and allow it to nourish trees and soils on its path to ground or surface waters. These tools help cities design streets to sustainably work with both dry and wet weather sources of water. During the wet season, rain and its byproduct, stormwater, are the primary sources of stormwater. During the dry season, man-made sources of water include urban runoff from irrigation, car washing, and other residential, commercial, and industrial activities.

Both dry and wet weather stormwater can contain bacteria and other pollutants, and are thereby regulated at the state and local level. Many of the sources of pollutants to waterways come from streets, which contain oils, rubber, metals, and galvanized materials from automobiles.



*Above, Parkway incorporating stormwater tools:
Bicknell Avenue, Santa Monica, CA
(Credit: Neil Shapiro)*

While conventional stormwater controls aim to move water off-site and into storm drains as quickly as possible, stormwater management seeks to use and store water on-site for absorption and infiltration in order to clean it naturally and use it as a resource. Therefore, the storm drain system becomes an overflow support system rather than a primary conveyance system. Stormwater management deals with water as an amenity rather than a liability.

Many of the stormwater management options discussed in this section can and should integrate easily with traffic calming measures installed along streets, such as boulevard islands, rotary islands, traffic circles, street ends, chicanes, and curb extensions. These elements can easily incorporate stormwater treatment into the landscape and stormwater tools can be made more cost-effective if integrated early in the design process.

Stormwater management also provides opportunities to leverage other streetscape elements and components of living streets. A strategic plan linking streetscape elements and street design can maximize benefits.

GOALS AND BENEFITS OF STORMWATER MANAGEMENT

The primary goals of stormwater management are as follows:

- Reduce—limit the amount of impervious surfaces that generate additional runoff
- Slow—friction slows flow
- Spread—allow water to be slowed enough to infiltrate
- Sink—keep water on site
- Store—contain water for direct non-potable/potable indoor/outdoor purposes
- Use—to irrigate and replace imported potable water

These goals can be expressed succinctly: slow it, spread it, store it, and sink it, but use it.

The tools provided in this section enable cities to attain regulatory compliance and provide the following ecological, economic, and aesthetic benefits:

- Reduced use of potable water for irrigation
- Reduced surface water pollution
- Support for the urban ecosystem and wildlife habitat
- Enhanced flood control
- Biological filtration and bioremediation
- Groundwater recharge
- Reduced heat island effect
- Education through best management practices (BMP) visibility
- Aeration of root zone
- Potential reductions in stormwater infrastructure and treatment cost
- Improved aesthetics and public space within neighborhoods

LOW IMPACT DEVELOPMENT PRINCIPLES OF STORMWATER MANAGEMENT

- **Use the conventional storm drain system as the overflow approach, not the primary system to manage stormwater.** Wherever possible, natural drainages should be the primary overflow.
- **Harvest, use, and/or store stormwater as close to its source as possible.** Wet weather rainfall and its byproduct, stormwater, can offset or eliminate imported potable irrigation water needs when harvested and used on-site. Harvesting and storing stormwater transforms a flooding liability into an on-site irrigation resource. This ensures natural waterways and their plant communities have local sources of water, thereby reducing the need for imported water. Harvesting and storing rainwater also reduces the need for costly drainage conveyance infrastructure for stormwater management.
- **Use on-site non-potable water sources for irrigation before any imported water source.** In dry weather, irrigation overspray can be reduced by enforcing existing laws/ordinances banning these practices. This leads to more efficient water use, reducing costly imported potable water consumption.
- **Select tools that mimic natural processes.** Minimize the cost of the installation and maintenance by using gravity flow rather than pumped flow, living filtration over synthetic/mechanical filtration, and living surface infiltration instead of piped drainage. Priority should also be given to pervious versus impervious surfaces. The primary purpose is to harvest and utilize rain as part of a healthy vegetated watershed. For example, vegetation can reduce runoff water volume and pollutant load, provide summer shade and cooling, and enhance wildlife habitat and sense of place with native vegetation rooted to the local ecosystem.
- **Maximize stormwater management by integrating it into the myriad design elements in the public right-of-way.** The water system is part of a larger, interconnected system. Maximize the benefits of stormwater strategies. For example, traffic calming and road diets can double as stormwater harvesting strategies. In addition, use vegetation to make streets better places and use stormwater management as an integral element of the urban forest.
- **Show the water flow.** The benefits of stormwater management are ecological, economic, and social. Make the functions described in this section visible for street users to see, understand, appreciate, and replicate. Public right-of-way stormwater installations can inspire private property installations and serve as model installations for neighborhoods. Visible water flow systems are also easier to maintain. Blockages are easier to notice and easier to access for regular maintenance.

DEFINITIONS

The terms below describe the elements and techniques of sustainable stormwater management.

Best Management Practice (BMP)—Operating methods and/or structural devices used to reduce stormwater volume, peak flows, and/or pollutant concentrations of stormwater runoff through one or more of the following processes: evapotranspiration, infiltration, detention, filtration, and biological and chemical treatment.

Bioretention—A soil and plant-based retention practice that captures and biologically degrades pollutants as water infiltrates through sub-surface layers containing microbes that treat pollutants. Treated runoff is then slowly infiltrated and recharges the groundwater. These biological processes operate in all infiltration-based strategies, including various retention systems.

Conveyance—This is the process of water moving from one place to another.

Daylight—This involves bringing stormwater or stormwater flow to the surface, exposed to open air and visible to the public.

Design Storm—Storms, whose magnitude, rate, and intensity do not exceed the design load for a storm drainage system or flood protection project, are considered design storms.

Detention—This is the process of collecting stormwater runoff at one rate and then releasing it at a controlled rate. The difference is held in temporary storage.

Dry weather runoff—Human activity-related sources of water, such as irrigation overspray, car wash runoff, leaking plumbing, fire hydrant and well flushing, and runoff from mechanical processes such as air conditioning are examples.

Filtration—A treatment process that allows for removal of solid (particulate) matter from water by means of porous media such as sand, soil, vegetation, or a man-made filter. Filtration is used to remove contaminants.

Hardscape—These are impermeable surfaces, such as concrete or stone, used in the landscape environment along sidewalks or in other areas used as public space.

Infiltration—This is the process by which water penetrates into soil from the ground surface.

Permeability/Impermeability—This is the quality of a soil or material that enables water or air to move through it, and thereby determines its suitability for infiltration-based stormwater strategies.

Retention—This is the reduction in total runoff that results when stormwater is diverted and allowed to infiltrate into the ground through existing or engineered soil systems.

Runnel—This narrow, shallow drainage channel is designed to carry small amounts of runoff.

Runoff—This is water from rainfall that flows over the land surface that is not absorbed into the ground.

Sedimentation—This is the deposition and/or settling of particles suspended in water as a result of the slowing of the water.

Softscape—These are the natural, permeable, landscape surfaces such as vegetation, mulch, and loose rock.

Stormwater—This is rainwater that flows and collects in the street

TOOLS FOR STORMWATER MANAGEMENT

There are many tools and best management practices (BMPs) for managing stormwater sustainably. Most popular are devices and practices that encourage water percolation on-site to the maximum degree practicable (given soil conditions, pollutant levels, etc.). The most important devices and practices are bioretention BMPs consisting of swales, planters, and vegetated buffer strips, as well as detention BMPs consisting of rain gardens, infiltration trenches, and dry wells. While permeable paving also slows and retains stormwater, it is listed separately because its primary function is to serve as a surfacing material that reduces runoff. Additional tools include delivery and conveyance tools and inlet protections.

The City of Norman has adopted the City of Wichita/Sedgwick County Stormwater Manual. This manual must be utilized as a guide in the selection and design of low impact development stormwater best management practices. The selection of these best management practices must be discussed with the City of Norman Department of Public Works. Considerations of the costs for installation, operation and maintenance must be made in the selection.

In addition, the stormwater management tools mentioned in this manual are highly customizable and can be integrated into a variety of different types of spaces in any of the street types. They can be implemented alone or in concert with one another to achieve cumulative benefits. Opportunity sites include medians, corner and midblock curb extensions, roadway and park edges, front building edges, and surrounding street trees. Selecting the appropriate BMP is very dependent on street type and site conditions. High traffic commercial streets have different parameters than smaller residential streets. The following sections describe techniques to site and construct systems to integrate stormwater management tools into both new and existing streets. Table 10.1 below describes typical applicability of specific stormwater tools to individual street types.

Table 11.1 Best Fit for Streetwater Tools by Street Context

STREET CONTEXT		BIORETENTION			DETENTION		PAVING	DELIVERY/ CONVEYANCE	INLET PROTECTIONS		
		Swales	Planters	Vegetated Buffer Strips	Rain Gardens	Infiltration Trenches and Dry Wells	Permeable Paving	Channels and Runnels	Screens	Inlet Inserts	Pipe Filters
Commercial	Downtown		o			o	o	o	o	o	o
	Throughway		o	o		o	o	o	o	o	o
	Neighborhood		o	o	o	o	o	o	o	o	o
Residential	Downtown	o	o		o	o	o	o	o	o	o
	Throughway	o	o		o	o	o	o	o	o	o
	Neighborhood	o	o		o	o	o	o	o	o	o
Industrial And Mixed-Use	Industrial	o	o		o	o	o	o	o	o	o
	Mixed-Use		o	o		o	o	o	o	o	o
Special	Sidewalk Furniture Zone	o	o		o	o	o	o	o	o	o
	Park Edge	o	o		o	o	o	o	o	o	o
	Boulevard	o	o		o	o	o	o	o	o	o
	Ceremonial (Civic)						o	o	o	o	o
Small	Alley		o			o	o	o	o	o	o
	Shared Public Way		o			o	o	o	o	o	o
	Walk Street		o	o		o	o	o	o	o	o

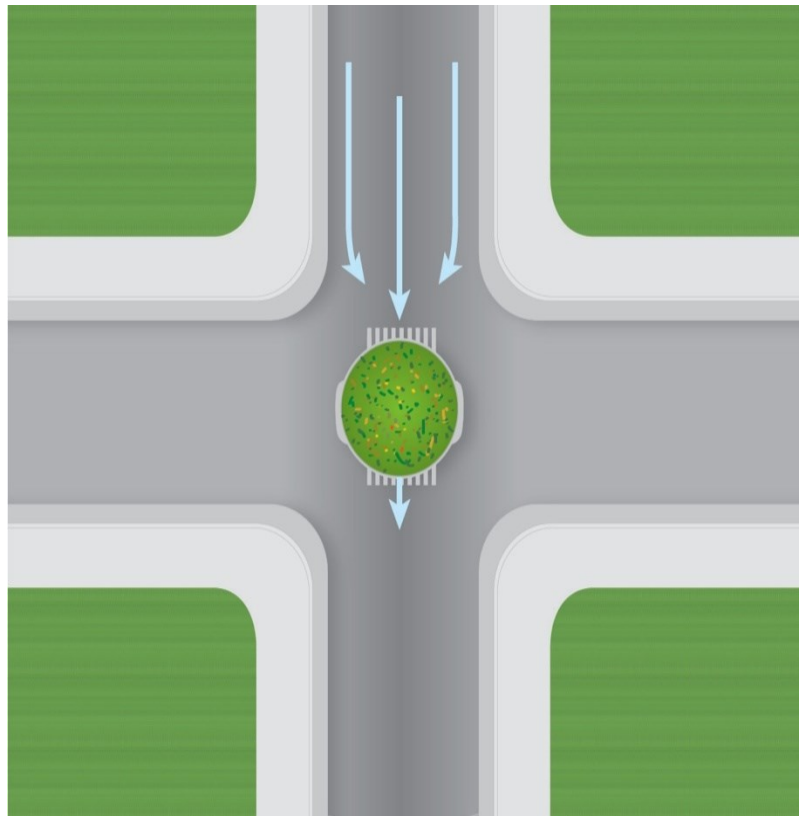
General Guidelines

Site Considerations

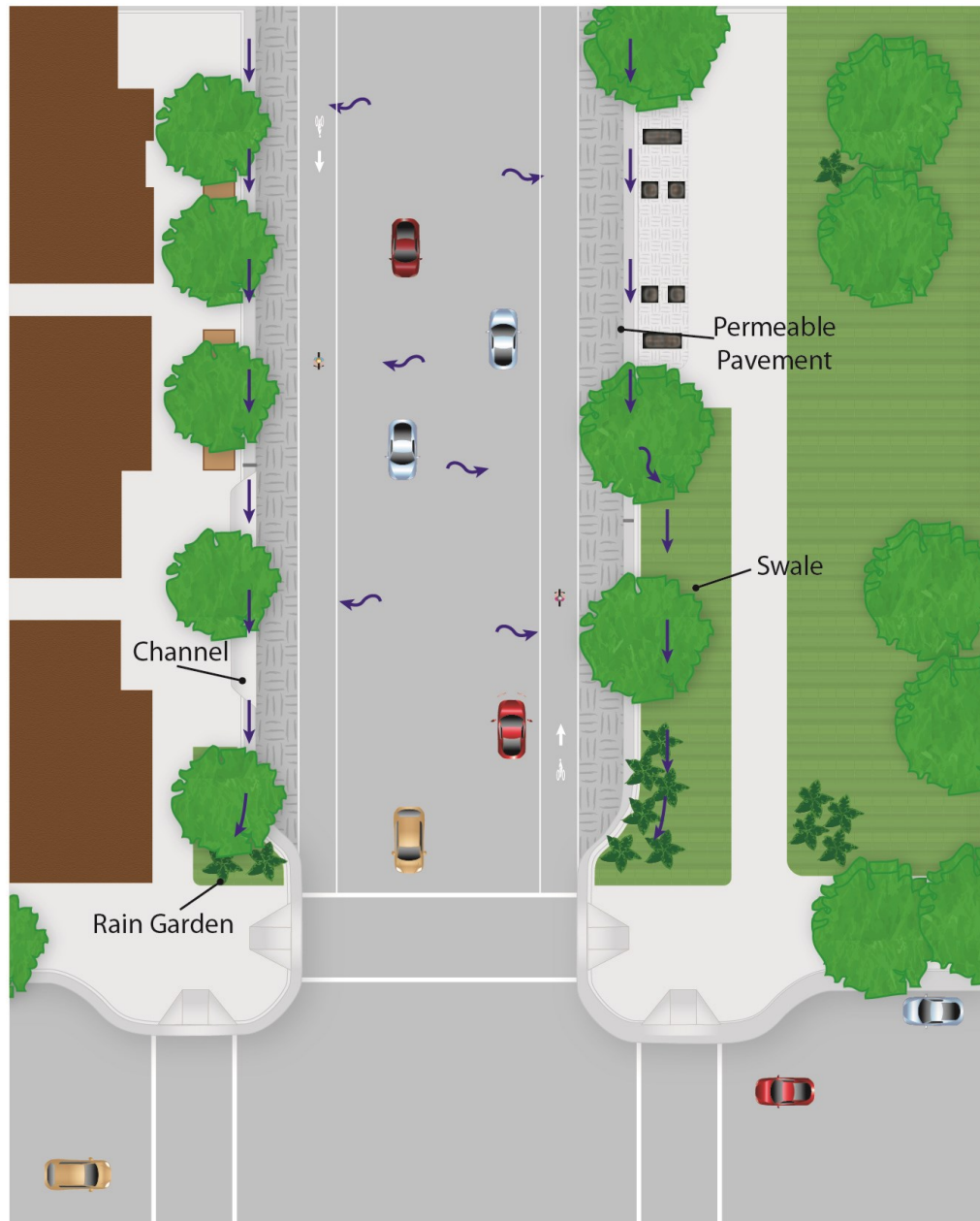
Streetscape geometry, topography, and climate determine the types of controls that can be implemented. The initial step in selecting a stormwater tool is determining the available open space and constraints. Although the maximum size of a selected stormwater facility may be determined by available area, the standard design storm should be used to determine the appropriate size, slope, and materials of each facility.

After identifying the appropriate stormwater facilities for a site, an integrated approach using several tools is encouraged. To increase water quality and functional hydrologic benefits, several stormwater management tools can be used in succession. This is called a treatment train approach. The control measures should be designed using available topography to take advantage of gravity for conveyance to and through each facility.

Traffic calming measures, such as medians, circles, chicanes, and curb extensions, should integrate stormwater management options discussed in this section. The first image at right illustrates a center-draining street utilizing a rain garden integrated into a circle. These areas offer ideal opportunities for treating runoff as they typically intercept the flow path of water along a street and provide additional surface and subsurface space for treating and infiltrating stormwater. By integrating stormwater management tools at an early design stage, new facilities can be added with only marginal cost when paired with other streetscape construction projects. The second image below illustrates a possible treatment on a traditional crowned street with traffic calming measures.



*Rain garden in rotary island
(Credit: Michele Weisbart)*



*Crowned complete street
(Credit: Michele Weisbart)*

Infiltration Considerations

Appropriate soils, infiltration media, and infiltration rates should be used for infiltration BMPs. Ideally, a complete geotechnical or soils report should be undertaken to determine infiltration rates, soil toxicity and stability, and other factors that will affect the ability and the desirability of infiltration. At a minimum, the infiltration capacity of the underlying soils should be deemed suitable for infiltration and appropriate media should be used in the BMP itself.

Using certain techniques, stormwater tools can still be incorporated into areas of low permeability or where infiltration of stormwater is not desirable. Underdrains should be used in areas of low soil permeability. The location of the underdrain is an important consideration: if placed higher in a facility, the stored water below the perforated pipe will be infiltrated. If placed at the bottom of a sealed system, the perforated pipe will release the stored water slowly over time. These infiltration BMPs may overflow to appropriate locations such as catch basins and outfalls.

Details are important to the ultimate success or failure of an infiltration system. Poor soil conditions may cause stormwater to infiltrate either too fast or too slow. Over-compaction of subsurface soil during construction can lead to reduced infiltration capacity, flooding, and ponding. The bottom surface of infiltration areas should be level to allow even distribution. Soils and gravels in an infiltration installation should be meticulously specified and verified in the field during construction. Proper maintenance is crucial to the success of an infiltration BMP. To ensure proper caretaking, a maintenance plan or contract with a local agency is necessary.

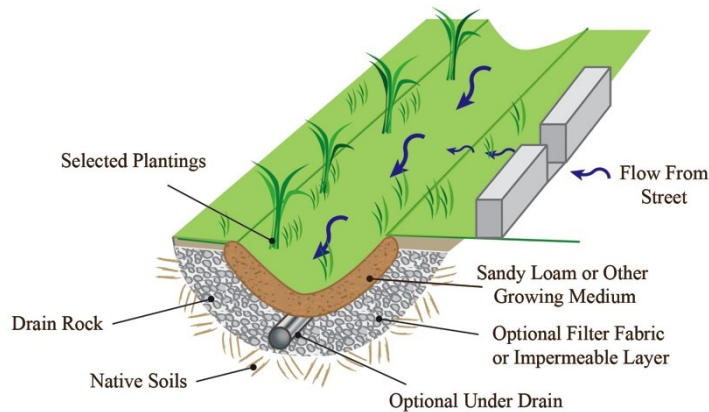
Bioretention



*Swale: Long Beach, CA
(Credit: Patricia Smith)*

Bioretention is a stormwater management process that cleans stormwater by mimicking natural soil filtration processes as water flows through a bioretention BMP. It incorporates mulch, soil pores, microbes, and vegetation to reduce and remove sediment and pollutants from stormwater. Bioretention is designed to slow, spread, and, to some extent, infiltrate water. Each component of the bioretention BMP is designed to assist in retaining water, evapotranspiration, and adsorption of pollutants into the soil matrix. As runoff passes through the vegetation and soil, the combined effects of filtration, absorption, adsorption, and biological uptake of plants remove pollutants.

For areas with low permeability or other soil constraints, bioretention can be designed as a flow-through system with a barrier protecting stormwater from native soils. Bioretention areas can be designed with an underdrain system that directs the treated runoff to infiltration areas, cisterns, or the storm drain system, or may treat the water exclusively through surface flow.



*Established swale in the landscape
(Credit: Julia Campbell and Michele Weisbart)*

Included in this section are discussions of swales, planters, and vegetated buffer strips.

Location and Placement

Bioretention facilities can be included in the design of all street components: adjacent to the traveled way and in the frontage or furniture sidewalk zones. They can be designed into curb extensions, medians, traffic circles, roundabouts, and any other landscaped area. Depending on the feature, maintenance and access should always be considered in locating the device. Bioretention systems are also appropriate in constrained locations where other stormwater facilities requiring more extensive subsurface materials are not feasible.

If bioretention devices are designed for infiltration, native soil should have a minimum permeability rate of 0.5 inches per hour and at least 10 feet to the ground water table. Sites with more than a 5 percent slope may require other stormwater management approaches or special engineering.

Guidelines

A sponge-like surface application of organic mulch can quicken the rate of absorption into the soil, slow soil moisture loss to evaporation, and reduce the solid waste stream if the mulch is generated from local organic matter. This strategy can also intercept and reduce sediment and nutrient concentrations in runoff via bioremediation.

Plants should be microclimate-appropriate and must be able to tolerate occasional saturation as well as dry periods (see the Urban Forestry section of this chapter for planting recommendations).

The use of multiple small devices is often more feasible in tight urban environments than the use of one large device. Small systems can be linked together to achieve the desired cumulative capacity.

Swales

Swales are linear, vegetated depressions that capture rainfall and runoff from adjacent surfaces. The swale bottom should have a gradual slope to convey water along its length. Swales can reduce off-site stormwater discharge and remove pollutants along the way. In a swale, water is slowed by traveling through vegetation on a relatively flat grade. This gives particulates time to settle out of the water while contaminants are removed by the vegetation. Because the vegetation receives much of its needed moisture through stormwater, the need for irrigation is greatly reduced.



Sidewalk-adjacent swale during storm event

(Credit: Edward Belden, Los Angeles and San Gabriel Rivers Watershed Council)

Location and placement—Swales can easily be located adjacent to roadways, sidewalks, or parking areas. Roadway runoff can be directed into swales via flush curbs or small evenly-spaced curb cuts into a raised curb. Swale systems can be integrated into traffic calming devices such as chicanes and curb extensions.

Swales can be placed in medians where the street drains to the median. Placed alongside streets and pathways, vegetated swales can be landscaped with native plants which filter sediment and pollutants and provide habitat for wildlife. Swales should be designed to work in conjunction with the street slope to maximize filtration and slowing of stormwater.

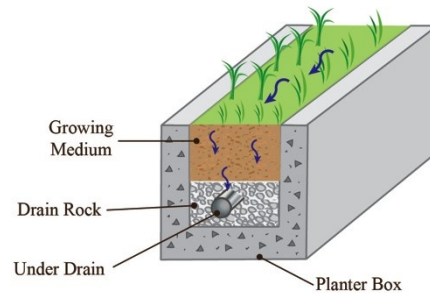
Guidelines—Soils that promote absorption and support vegetation, such as sandy loams, should be specified on a case-by-case basis. Base layers of rock and stabilizing filter fabric may also be specified. Swale length, width, depth, and slope should be determined by capacity needed for treatment of the design storm.

Swales are designed to allow water to slowly flow through. Depending on the landscape and design storm, an overflow or bypass for larger storm events may be needed. Curb openings should be designed to direct flow into the swale. Following the inlet, a sump may be built to capture sediment and debris. Mulch can be used in systems where it will not escape the swale system, such as in flatter, deeper swales. Check dams should be used to slow the velocity of water and catch sediment when the slope along the length of the swale exceeds 4 percent.

Swales should be landscaped with deep-rooted grasses and vegetation that tolerate short periods of inundation, deposits of sediment, and periods of drought. Vegetation will filter sediment and slow erosion, protecting the swale from failure. The sides of swales should be minimally sloped to protect the swale from erosion and slope failure.



*Swale with curb cut opening and decorative grate outlet
(Credit: AHBE Landscape Architects)*



Planter detail (Credit Julia Campbell and Michele Weisbart)

Planters

Planters are typically above-grade or at-grade with solid walls and a flow-through bottom. They are contained within an impermeable liner and use an underdrain to direct treated runoff back to the collection system. Where space permits, buildings can direct roof drains first to building-adjacent planters. Both underdrains and surface overflow drains are typically installed with building-adjacent planters.

At-grade street-adjacent planter boxes are systems designed to take street runoff and/or runoff from sidewalks and incorporate bioretention processes to treat stormwater. These systems may or may not include underdrains.

Location and placement—Above-grade planters should be structurally separate from adjacent sidewalks to allow for future maintenance and structural stability per local department of public works' standards. At-grade planter systems can be installed adjacent to curbs within the frontage and/or furniture zones.

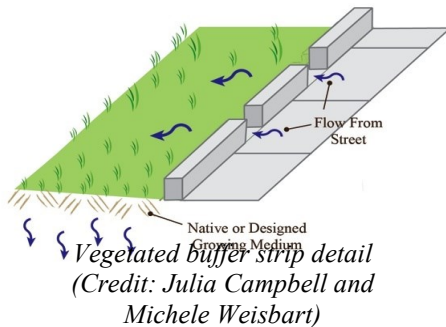
Guidelines—All planters should be designed to pond water for less than 48 hours after each storm. Flow-through planters designed to detain roof runoff can be integrated into a building's foundation walls, and may be either raised or at grade.

For at-grade planters, small localized depressions may be included in the curb opening to encourage flow into the planter. Following the inlet, a sump (depression) to capture sediment and debris may be integrated into the design to reduce sediment loadings.



*Planters along a downtown street
(Credit: David Riesland)*

Vegetated Buffer Strips



Vegetated buffer strips are sloping planted areas designed to treat and absorb sheet flow from adjacent impervious surfaces. These strips are not intended to detain or retain water, only to treat it as a flow-through feature. They should not receive concentrated flow from swales or other surface features, or concentrated flow from pipes.

Location and placement—Vegetated buffer strips are well-suited to treating runoff from roads and highways, small parking lots, and pervious

surfaces. They may be commonly used on multi-way boulevards, park edge streets, or sidewalk furniture zones with sufficient space. Vegetated buffers can be situated so they serve as pre-treatment for another stormwater management feature, such as an infiltration BMP.

Guidelines—Buffer strips cannot treat large amounts of runoff; therefore, the maximum drainage width (with the direction of flow being towards the buffer) of the contributing drainage area should be 60 feet. In general, a buffer strip should be at least 15 feet wide in the direction of flow to provide the highest water quality treatment.

The top of the strip should be set 2 to 5 inches below the adjacent pavement or contributing drainage area, so that vegetation and sediment accumulation at the edge of the strip does not prevent runoff from entering.

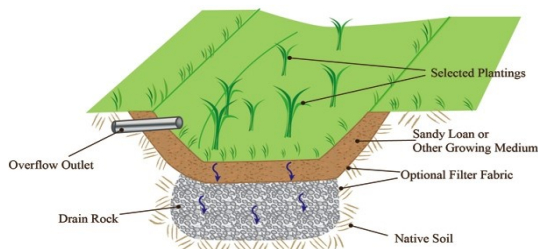
Buffer strips should be sited on gentle slopes. Steep slopes in excess of 15 percent may trigger erosion during heavy rain events, thus eliminating water quality benefits.

Detention

Detention devices differ from retention in that they are designed and sized to hold a specific volume of water and then slowly release it over time. On the other hand, the bioretention

BMPs described in the previous section are designed and sized based on flow—the rate of water passing through them. The objective of bioretention is to improve the quality of stormwater by promoting filtration and adsorption as water flows through vegetation and soil. Detention devices do not function as flow-through features, but rather the objective is to collect and contain water until it is removed by controlled release or infiltrated into the soil. Overflow outlets may be included to manage large storm events. Pollutants may be removed by vegetation and the topsoil layer as in bioretention BMPs so that stormwater is treated before it is infiltrated. Detention devices can greatly reduce the volume of runoff from streetscapes and for small storm events may completely eliminate runoff.

Rain Gardens



Rain garden detail

(Credit: Julia Campbell and Michele Weisbart)

Rain gardens are vegetated depressions in the landscape. They have flat bottoms and gently sloping sides. Rain gardens can be similar in appearance to swales, but their footprints may be any shape. Rain gardens hold water on the surface, like a pond, and have overflow outlets. The detained water is infiltrated through the topsoil and subsurface drain rock unless the volume of water is so large that some must overflow. Rain gardens can reduce or eliminate off-site stormwater discharge while increasing on-site recharge.



Rain garden in an urban landscape

(Credit: Kevin Robert Perry)

Location and placement—Rain gardens may be placed where there is sufficient area in the landscape and where soils are suitable for infiltration. Rain gardens can be integrated with traffic calming measures installed along streets, such as medians, islands, circles, street

ends, chicanes, and curb extensions. Rain gardens are often used at the terminus of swales in the landscape.



*Rain garden: Portland, OR
(Credit: Brad Lancaster, www.HarvestingRainwater.com)*

Guidelines—Native soils should have a minimum permeability rate of 0.5 inches per hour and at least 10 feet to the ground water table. Sites with more than a 5 percent slope may require other stormwater management approaches or special engineering considerations. The topsoil layer should be designed on a case-by-case basis and may often be a type of sandy loam. Subsurface drain rock will promote infiltration and should also be designed for each installation. Local public works departments may have additional guidelines for rain garden design.

The size and shape of rain gardens will vary in each case and the available area in the landscape may determine the maximum footprint. Because rain gardens are volume-based BMPs, their surface area and depth will be designed to achieve the desired detention volume. Overflow outlets should be below the lip of the rain garden and at a height consistent with the desired detention volume. Sides should be gently sloping to prevent erosion.

Rain gardens should be landscaped with deep-rooted grasses and other vegetation that can tolerate short periods of inundation, deposits of sediment, and periods of drought.

Infiltration Trenches and Dry Wells

Infiltration trenches are linear, rock-filled features that promote infiltration by providing a high ratio of sub-surface void space in permeable soils. They provide on-site stormwater retention and may contribute to groundwater recharge. Infiltration trenches may accept stormwater from sheet flow, concentrated flow from a swale or other surface feature, or

pipled flow from a catch basin. Because they are not flow-through BMPs, infiltration trenches do not have outlets but may have overflow outlets for large storm events.

Dry wells are typically distinguished from infiltration trenches by being deeper than they are wide. They are usually circular, resembling a well, and are backfilled with the same materials as infiltration trenches. Dry wells typically accept concentrated flow from surface features or from pipes and do not have outlets.

Infiltration trenches and dry wells are typically designed to infiltrate all flow they receive. In large storm events, partial infiltration of runoff can be achieved by providing an overflow outlet. In these systems, significant or even complete volume reduction is possible in smaller storm events. During large storm events, these systems may function as detention facilities and provide a limited amount of retention and infiltration.

Location and placement guidelines—Infiltration trenches and dry wells typically have small surface footprints so they are potentially some of the most flexible elements of landscape design. However, because they involve sub-surface excavation, these features may interfere with surrounding structures. Care needs to be taken to ensure that surrounding building foundations, pavement bases, and utilities are not damaged by infiltration features. Once structural soundness is ensured, infiltration features may be located under sidewalks and in sidewalk planting strips, curb extensions, roundabouts, and medians. When located in medians, they are most effective when the street is graded to drain to the median. Dry wells require less surface area than trenches and may be more feasible in densely developed areas.

Infiltration features should be sited on uncompacted soils with acceptable infiltration capacity. They are best used where soil and topography allow for moderate to good infiltration rates (0.5 inches per hour) and the depth to groundwater is at least 10 feet. Prior to design of any retention or infiltration system, proper soil investigation and percolation testing should be conducted to determine appropriate infiltration design rates. Any site with potential for previous underground contamination should be investigated. Infiltration trenches and dry wells can be designed as stand-alone systems when water quality is not a concern or may be combined in series with other stormwater tools.

Pre-treatment, design, and installation guidelines—Infiltration features do not treat stormwater and may become damaged by stormwater carrying high levels of sediment. In general, infiltration features should be designed in series with bioretention tools unless the infiltration features receive water from well-vegetated areas where sediment is not expected. Pre-treatment features should be designed to treat street runoff prior to discharging to infiltration features. Bioretention devices, sumps, and sedimentation basins are several pre-treatment tools effective at removing sediment.

Trenches and dry wells are typically backfilled with coarse drain rock (coarse gravel) and may or may not be lined with filter fabric. Additional void space can be achieved by including materials such as perforated pipes, half pipes, or open blocks within the drain rock. The trench surface can be planted, covered with grating, covered with boardwalks, or

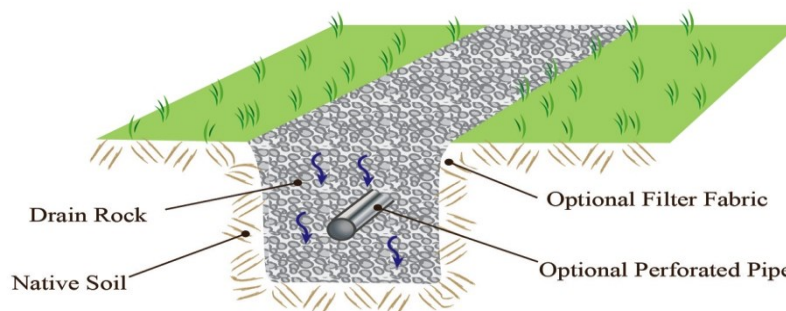
simply remain as exposed drain rock. Local public works departments should be contacted for any local guidance on infiltration feature design.

The slope of the infiltration trench bottom should be designed to be level or with a maximum slope of 1 percent. Infiltration BMPs should be installed parallel to contours with maximum ground slopes of 20 percent and be located no closer than 5 feet to any building structure. Sub-soils should not be compacted. Drain rock and, if needed, filter fabric with an overflow drain should be designed for each installation.

Perforated pipes and piped inlets and outlets may be included in the design of infiltration trenches. Cleanouts should be installed at both ends of any piping, and at regular intervals in long sections of piping, to allow access to the system. Monitoring wells are recommended for both trenches and wells and can be combined with clean-outs. If included, the overflow inlet from the infiltration trench should be properly designed for anticipated flows.



*Infiltration trench with perforated pipe during installation
(Credit: Neil Shapiro)*



Infiltration trench
(Credit: Julia Campbell and Michele Weisbart)

Paving

Permeable Paving

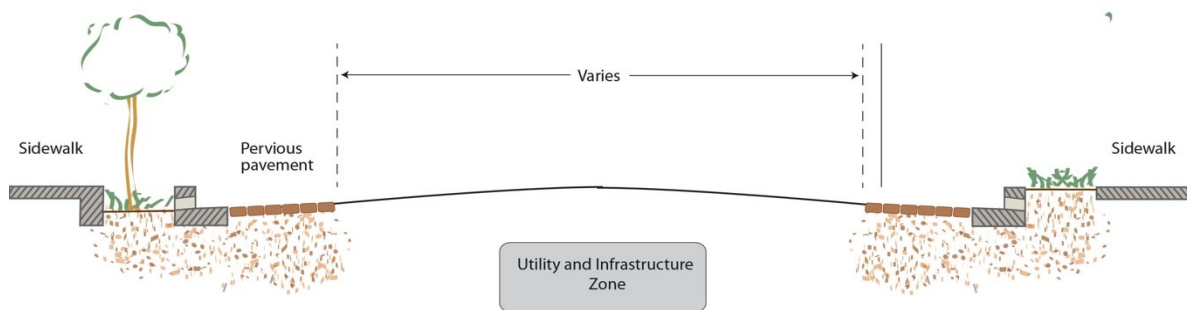
Permeable paving is a system with the primary purpose of slowing or eliminating direct runoff by absorbing rainfall and allowing it to infiltrate into the soil. This BMP is impaired by sediment-laden run-on which diminishes its porosity. Care should be taken to avoid flows from landscaped areas reaching permeable paving. In those cases, bioretention is a better choice for BMPs. Permeable paving is, in certain situations, an alternative to standard paving. Conventional paving is designed to move stormwater off-site quickly. Permeable paving, alternatively, accepts the water where it falls, minimizing the need for management facilities downstream.

Permeable paving:

- Filters and cleans pollutants such as petroleum deposits on streets
- Reduces water volumes for existing overtaxed pipe systems
- Decreases the cost of offsite or onsite downstream infrastructure



Permeable concrete after a rain event
(Credit: Neil Shapiro)



Street section elevation illustrating placement of pervious pavement
(Credit: Marty Bruinsma)

Location and placement guidelines—Conditions where permeable paving should be encouraged include:

- Sites where there is limited space in the right-of-way for other BMPs
- Parking or emergency access lanes
- Furniture zones of sidewalks especially adjacent to tree wells

Conditions where permeable paving should be avoided include:

- Where runoff is already being harvested from an impervious surface for direct use, such as irrigation of bioretention landscape areas
- Steep streets
- Large traffic volume or heavy load lanes
- Gas stations, car washes, auto repair, and other sites/sources of possible chemical contamination
- Areas with shallow groundwater
- Within 20 feet of sub-sidewalk basements
- Within 50 feet of domestic water wells

Material guidelines—When used as a road paving, pervious pavement that carries light traffic loads typically has a thick drain rock base material. Pavers should be concrete as opposed to brick or other light-duty materials. Other possible permeable paving materials include porous concrete and porous asphalt. These surfaces also have specific base materials that detain infiltrated water and provide structure for the road surface. Base material depths should be specified based on design load and the soils report.

Plazas, emergency roads, and other areas of limited vehicular access can also be paved with permeable pavement. Paving materials for these areas may include open cell paver blocks filled with stones or grass and plastic cell systems. Base material specifications may vary depending on the product used, design load, and underlying soils.

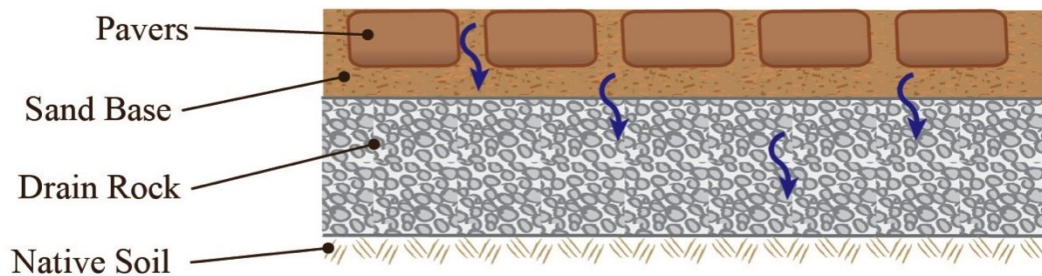
When used for pedestrian paths, sidewalks, and shared-use paths, appropriate materials include those listed above as well as rubber pavers and decomposed granite or something similar (washed or pore-clogging fine material). Pedestrian paths may also use broken concrete pavers as long as ADA requirements are met. Paths should drain into adjoining landscapes and should be higher than adjoining landscapes to prevent run-on. Soil paths are not successful on slopes in excess of 4 percent. Any pervious materials used for sidewalks or paths should be very smooth for wheelchairs and bicyclists.



Permeable paving and a trench drain in a parking area
(Credit: Stephanie Landregan)

Design guidelines—Design considerations for permeable paving include:

- The location, the slope and load-bearing capacity of the street, and the infiltration rate of the soil
- The amount of storage capacity of the base course
- The traffic volume and load from heavy vehicles
- The design storm volume calculations and the quality of water
- Drain rock, filter fabrics, and other subsurface materials
- Installation procedures including excavation



Pervious pavement detail
(Credit: Julia Campbell and Michele Weisbart)

A soil or geotechnical report should be conducted to provide information about the permeability and load-bearing capacity of the soil. Infiltration rate and load capacity are key factors in the functionality of this BMP. Permeable paving generally does not have the same load-bearing capacity as conventional paving, so this BMP may have limited applications depending on the underlying soil strength and paving use. Permeable paving should not be used in general traffic lanes due to the possible variety of vehicles weights and heavy volumes of traffic.

The soil report should also provide the depth of the water table to determine if permeable pavers are an appropriate application for the site. Pervious pavement typically requires a 4-foot or more separation from the water table or bedrock to properly infiltrate stormwater. Pervious pavement is not recommended over new or compacted fill.

Because permeable pavement is damaged by sediment deposits, it should be carefully placed in the landscape so as to avoid run-on, especially from sediment-laden sources such as landscaped areas.

Pavement used for sidewalks and pedestrian paths should be ADA compliant, especially smooth, and not exceed a 2 percent slope or have gaps wider than 0.25 inches. In general, tripping hazards should be avoided.

Maintenance and installation guidelines—Proper construction and installation of permeable pavement is vital to its success. To ensure that the paving system functions properly, sub-base preparation and stormwater pollution prevention measures should be performed appropriately during installation.

Construction considerations include:

- Scarifying soils so that they remain porous
- Avoiding compaction of soils
- Preventing run-on and sedimentation during construction

Maintenance of permeable pavement systems is essential to their continued functionality. Regular vacuuming and street sweeping should be performed to remove sediment from the pavement surface. The bedding and base material should be tested to ensure sufficient infiltration rates on a regular basis. Additionally, base material may need to be removed and replaced every several years based upon the material manufacturer's specifications.

Delivery and Conveyance

Water conveyance measures in the hardscape may support the treatment BMPs outlined above. By daylighting streetwater flow, these measures draw attention to water movement and can in turn highlight bioretention and detention BMPs. Delivery and conveyance measures do not treat streetwater for quality and do not reduce water volume. They are therefore only recommended as supporting infrastructure, a preferable alternative to traditional piped flow.

Channels, Runnels, Trench Drains, and Constructed Swales

Channels, runnels, trench drains, and constructed swales are conventional methods of conveying moderate amounts of stormwater from buildings and impervious surfaces to other drainage collection systems, streets, or planters. They are hardscape features constructed from impermeable materials.

Typically, these structures work well where there is a need for water redirection and space is limited. These hardscape methods may serve to move stormwater from the street to landscaped areas. Channels and constructed swales are not used for stormwater treatment but serve as daylighted, visible conveyance features in lieu of closed pipe systems. They provide opportunities to acknowledge natural drainage processes with artistic design features along the drainage path.

A variety of materials can be used for channels, runnels, and constructed swales: stone, brick, pebbles, pavers, and concrete. Rock swales can be created by arranging stones loosely and mortaring them in place. When a closed top is required, grates can be constructed; proprietary products in standard sizes are readily available. Decorative grates are aesthetic and help illustrate water flow processes.

Because these structures are gravity fed, they require slopes to function properly. On slopes greater than 6 percent, check dams or other velocity reduction devices should be provided.

These conveyance features may direct sheet flow to bioretention or infiltration features or simply serve as an alternative to piped flow in conventional drainage systems. Dimensions should be determined based on the design storm.

Channels have vertical sides and provide a drainage path to a downstream stormwater management feature. Channels vary in depth depending on the amount of flow they are designed to carry, have a sloped bottom, and can be covered or open. In some cases, channels can be constructed with pervious bottoms. Channels can be placed in plazas, driveways, and other hardscapes where conveyance is needed. Channels may be used in some situations where swales or pipes would be too costly or impossible due to site constraints. In broad landscape contexts, channels can be large and constructed to carry large volumes of water.

Runnels are shallower than channels, typically only a couple of inches deep, and are designed to carry small flows of stormwater. Runnels may have an open top but must be covered if they cross pedestrian walkways. Most often runnels are used to convey runoff from hardscapes to adjacent stormwater treatment landscapes. Runnels may be very useful in pedestrian hardscape areas where artistic construction is highly visible. The location and design of runnels should be carefully selected so that they do not pose tripping hazards.



*Decorative runnel and fountain
(Credit: Stephanie Landregan)*

Trench drains are a type of conveyance system similar to runnels. Trench drains differ from runnels in that they are usually smaller and have a grated top. They also have solid sides and bottoms. Trench drains are available in standard sizes and dimensions from a variety of manufacturers.



*Trench drain in hardscape
(Credit: Stephanie Landregan)*

Constructed swales are similar to the swales discussed earlier but are constructed from impervious materials. They typically are long narrow depressions used to convey water. The size of a swale should be determined by the design storm and landscape features.



*Constructed swale with drain
(Credit: Stephanie Landregan)*

Access, design, and maintenance guidelines—All conveyance structures, both open and covered, need to meet accessibility guidelines when in the path of travel. Boardwalks can cover large swales, or decorative grates can be used over smaller widths.

Channels, runnels, and constructed swales should be designed to meet the local agency design storm requirements. Overflow features may be required in some areas and should drain to the nearest gutter or other drainage feature, always draining away from adjacent properties. These features should be designed to allow debris to move through them and account for stoppages that could limit the drainage capacity.

Maintaining a clear conduit is essential for the proper functioning of conveyance structures. These features should be cleaned before the rainy season and checked before and after storm events. Trash, cigarette butts, soil sediment, and leaf litter all can contribute to failure and decrease the function of these features.

Storm Drain Inlet Protections: Retrofitting Existing Storm Drains

Existing storm drain systems may be retrofitted to improve stormwater quality without costly capital improvements. The BMPs described below can be used with existing conventional piped storm drain systems to address water quality but not water volume concerns. The measures described below are designed to prevent particulates, debris, metals, and petroleum-based materials conveyed by stormwater from entering the storm drain system. All storm drain protection units should have an overflow system that allows the storm drain to remain functional if the filtration system becomes clogged during rainstorms.

Typical maintenance of catch basins includes scheduled trash removal if a screen or other debris capturing device is used. Street sweeping should be performed by vacuum sweepers

with occasional weed and large debris removal. Maintenance should include keeping a log of the amount of sediment collected and the data of removal. Some cities have incorporated the use of GIS systems to track sediment collection and to optimize future catch basin cleaning efforts. Bulb-outs should be designed with two return curves with a radius of over 10 feet to allow street sweepers to clean the corners.

All inlet tools located in the pedestrian access route should conform to ADA requirements.



*Curb inlet grate catching debris
(Credit: David Riesland)*

Storm Drain Inlet Screens: Placement and Guidelines

Inlet screens are designed to prevent large litter and trash from entering the storm drain system while allowing smaller particles to pass through. The screens function as the first preventive measure in removing pollutants from the storm water system. Storm drain inlet screens can be designed and fabricated on an as-needed basis; proprietary screens are readily available for standard size inlets.

Inlet screens are external units mounted on existing curb side storm drain catch basins. The unit captures bigger particles and allows the storm water and small particles to pass through. The screen can be mounted on hinges to create a bypass if the screen is clogged during a storm.

A wide range of storm drain inlet screens is available. The Engineering Division of the city's Department of Public Works should be consulted to ensure compliance with local specifications and to schedule regular maintenance. Annual inspection of the screen is recommended to ensure functionality.

Storm Drain Inlet Protection: Placement and Guidelines

The inlet protection should be designed to protect curbside catch basins or inlets within the traveled way. Inlet inserts contain filter cartridges that can be easily replaced.

The inlet protection can be installed on the existing wall of the catch basin. It can be placed on the curb side wall of catch basins so that during storm events water can overflow around the unit.

Inlet inserts should be sized to capture all debris and should therefore be selected to match the specific size and shape of each catch basin and inlet. Maintenance should be taken into account—systems with lower maintenance requirements are preferred.

Storm Drain Pipe Filter: Placement and Guidelines

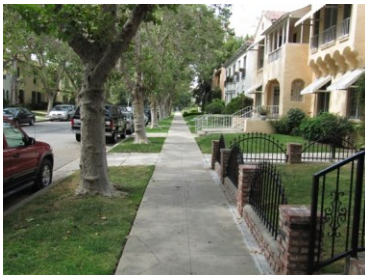
The storm drain outlet pipe protection or filter is designed to be installed on an existing outlet pipe or at the bottom of an existing catch basin with an overflow. This filter removes debris, particulates, and other pollutants from stormwater as it leaves the storm drain system. This BMP is less desirable than a protection system that prevents debris from entering the storm drain system because the system may become clogged with debris.

Outlet pipe filters can be placed on existing curbside catch basins and flush grate openings. Regular maintenance is required and inspection should be performed rigorously. Because this filter is located at the outlet of a storm drain system, clogging with debris is not as apparent as with filters at street level. This BMP may be used as a supplemental filter with an inlet screen or inlet insert unit.

URBAN FORESTRY

The urban forest includes all trees, shrubs, and other understory plantings on both public and private lands. Street trees and landscaping are essential parts of the urban forest, as they contribute positively to the urban environment—to climate control, stormwater collection, and the comfort and safety of people who live or travel along the street. A street lined with trees and other plantings looks and feels narrower and more enclosed, which encourages drivers to slow down and to pay more attention to their surroundings. Trees provide a physical and a psychological barrier between pedestrians and motorized traffic, increasing safety as well as making walking more enjoyable.

A healthy urban forest is also a powerful stormwater management tool. Leaves and branches catch and slow rain as it falls, helping it to soak into the ground. The plants themselves take up and store large quantities of water that would otherwise contribute to surface runoff. Part of this moisture is then returned to the air through evaporation to further cool the city.



As an important element along sidewalks, street trees must be provided with conditions that allow them to thrive, including adequate uncompacted soil, water, and air. This section provides guidance for appropriate conditions and selecting, planting, and caring for street trees, as well as for other landscaping along streets.

Appropriate local street trees
(Credit: Dan Burden)

STREET TREES

Goals and Benefits of Street Trees

The goal of adding street trees is to increase the canopy cover of the street, the percentage of its surface either covered by or shaded by vegetation, not simply to increase the overall number of trees. The selection, placement, and management of all elements in the street should enhance the longevity of a city's street trees and healthy, mature plantings should be retained and protected whenever possible.

A large tree will yield \$48 to \$62 in average annual net benefits over 40 years with costs factored in (McPherson, G. et al, "Tree Guidelines for San Joaquin Valley Communities," Western Center for Urban Forest Research and Education, USDA Forest Service, 1999). Adding street trees:

- Creates shade to lower temperatures in a city, reduces energy use, and makes the street a more pleasant place in which to walk and spend time
- Slows and captures rainwater, helping it soak into the ground to restore local hydrologic functions and aquifers
- Improves air quality by cooling air, producing oxygen, and absorbing and storing carbon in woody plant tissues
- Increases property values and sales revenues for existing businesses
- Enhances local neighborhood and cultural identity through specific plant forms and materials, the act of planting and sharing food crops, or by creating sheltering spaces for social interaction
- Enhances safety and personal security on a street by calming traffic and by fostering a denser and more consistent human presence, also referred to as eyes on the street
- Provides cover, food, and nesting sites for indigenous wildlife as well as facilitates habitat connectivity

Principles for Street Trees

The following principles influence the selection of street trees and landscaping design:

- **Seek out and reclaim space for trees**—Streets have a surprising number of residual or left-over spaces between areas required for travel lanes and parking, once they are examined from this perspective. Traffic circles, medians, channelization islands, and curb extensions can provide space for trees and landscaping.
- **Create optimum conditions for growth**—Space for roots and above ground growth is the main constraint to the urban forest achieving its highest potential. Typically a 6 to 8-foot wide, continuous sidewalk furniture zone must be provided, with uncompacted soil to a minimum of a 3-foot depth. If space for trees is constrained, provisions should be made to connect these smaller areas below the surface to form larger effective areas for the movement of air, root systems, and water through the soil.
- **Select the right tree for the space**—In choosing a street tree, consider what canopy, form, and height will maximize benefits over the course of its life. Provide necessary clearances below overhead high-intensity electrical transmission lines and prevent limbs from overhanging potentially sensitive structures such as flat roofs. In commercial areas where the visibility of façade-mounted signs is a concern, choose species whose mature canopy allows for visibility, with the lowest branches at a height of 12 to 14 feet or more above the ground. Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.
- **Start with good nursery stock and train it well**—When installing plant material, choose plants that have complete single leaders and are in good "form," and check that boxed trees are not root bound. Proper watering and pruning every three to four years will allow trees to mature and thrive for many years of service.
- **Do not subject plants to concentrated levels of pollutants**—Trees and other plants should be integrated within streetwater management practices whenever possible, but filtering of pollutants from "first flush" rain falls and street runoff will extend the life of trees and prevent toxic buildup of street pollutants in tree wells.

Guidelines

Climate and Soil

Selecting trees that are adapted to a site's climate and local rain cycles can create a more sustainable urban forest. The urban environment is harsh for many plants. Often plants native to an area are best adapted to that area's climate. Select plants that can tolerate the environmental elements, such as radiant heat from the sidewalk or street surface or 50 to 60 mph winds from passing traffic.

Urban soils have become highly compacted through construction activities and the passage of vehicle and even foot traffic. Compaction reduces the soil's capacity to hold and absorb water. Plants need healthy soil, air, and water to thrive.

Using planters in the urban forest can increase the biomass and canopy cover, but these plants and trees are still compromised and confined. At its bottom and sides a barrier will exist as the prepared area meets the surrounding compacted soils. Covering the soil surface with some form of mulch can help as the shade, cooling, and retained moisture that mulch provides help support the biological activities close to the soil's surface. These activities open the pore structure of the soil over time, help keep it open, and cushion the impact of foot traffic. This process works better if the mulch material is organic, as opposed to stones. If planters have limited resources for soil preparation they should have an extensive covering of mulch.

The generalized soil types map for a city can be used as a starting point when planning projects, but then the basic soil classifications should be identified on-site, especially when confronted by planting sites at the extreme ends of the spectrum: very fast-draining, nutrient-poor sands and dense, often nutrient-rich but oxygen-starved poorly drained clays.



Street trees (Credit: David Riesland)

Planting Sites

Traditionally, trees have been squeezed into whatever limited space is easily found, but this does not work well for either the tree or the street. The following guidelines provide recommended planting areas:

- Establish and maintain 6 to 8-foot wide sidewalk furniture zones where possible. Many large trees need up to 12 feet in width, and are not suitable for placement in narrower furniture zones. In residential areas, sidewalk furniture zones within the root zone should be unpaved and planted/surfaced with low groundcover, mulch, or stabilized decomposed granite where these can be maintained. Where maintenance of such extensive sidewalk furniture zones is not feasible, provide 12-foot long tree wells with true permeable pavers (standard interlocking pavers are not permeable).
- If the above conditions are not feasible, provide for the tree's root system an adequate volume of uncompacted soil or structural or gap-graded soil (angular rock with soil-filled gaps) to a depth of 3 feet under the entire sidewalk (in the furniture, frontage, and pedestrian sidewalk zones).
- Spacing between trees will vary with species and site conditions. The spacing should be 10 percent less than the mature canopy spread. Closer spacing of large canopy trees is encouraged to create a lacing of canopy, as trees in groups or groves can create a more favorable microclimate for tree growth than is experienced by isolated trees exposed to heat and desiccation from all sides. On residential streets where lots are 40 or 50 feet wide, plant one tree minimum per lot between driveways. Where constraints prevent an even spacing of trees, it is preferable to place a tree slightly off the desired rhythm than to leave a gap in the pattern.
- Planting sites should be graded, but not overly compact, so that the soil surface slopes downward toward the center, forming a shallow swale to collect water. The crown of the tree should remain 2 inches above finished grade and not be in the center of a swale, but off to the side. The finished soil elevation after planting is held below that of the surrounding paving so 2 to 3 inches of mulch can be added. The mulch layer must be replenished as needed to maintain a nearly continuous level surface adjacent to paving.
- Generally tree grates and guards are best used along streets with heavy pedestrian traffic. Along streets without heavy foot traffic and in less urban environments, use mulch in lieu of tree grates.

Species Selection

- Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.
- In general, street trees should be species that will achieve a height and spread of 50 feet on residential streets and 40 feet on commercial streets within 10 years of planting to provide reasonable benefits. Typically, trees on commercial streets will not achieve the same scale as they will on residential streets where greater effective root zone volumes may be achieved. On commercial streets with existing multi-story buildings and narrow sidewalks, select trees with a narrower canopy than can be accommodated on the limited sidewalk width.

- Cities should establish a list of recommended tree species for use in the public street rights-of-way. A city's list of recommended tree species should specify minimum planting site widths for each and which trees may be planted below utility lines. Where overhead power lines are less than 50 feet above grade, braided insulated electrical wire should be used so that trees do not have to be pruned to avoid the electrical lines. If braided insulated electrical wire cannot be provided, appropriate trees that will not grow tall enough to reach the power lines should be specified and planted.
- Trees that are part of stormwater management practices must be species that respond well to the extremes of periodic inundation and dry conditions found in water catchment areas. Design of all planting areas should include provisions for improved stormwater detention and infiltration.
- Consistent use of a single species helps reinforce the character of a street or district, but a diversity of species may help the urban canopy resist disease or insect infestations. New plantings added to streets with existing trees should be selected with the aim of meeting the same watering requirements and creating visual harmony with existing trees and plantings. Native species should be considered for inclusion whenever possible, but consideration should be first given to a species' adaptability to urban conditions.
- Consider evergreen species where it is desirable to maintain foliage through the winter months, such as to slow stormwater through the rainy season.
- Consider deciduous species where their ability to allow sunlight to penetrate into otherwise shaded areas (such as south facing windows of adjoining buildings) during the winter months will be a plus.

Tree Spacing and Other Considerations

- See Chapter 3, "Traveled Way Design," for an understanding of how to take intersection sight distance into account when designing intersections. Many jurisdictions have tree spacing requirements at intersections, which typically vary from 30 to 45 feet, to provide visibility at corners. However, as discussed in Chapter 3, this distance can often be reduced with no compromise in safety in slow speed environments.
- Most jurisdictions have spacing requirements between trees and street lights (typically about 30 feet high), which typically vary from 10 to 20 feet. The smaller setback provides greater flexibility in tree spacing and allows for a more complete tree canopy.
- Pedestrian lights, which are about 12 feet tall, generally do not conflict with the tree canopy, so spacing is less rigid. Some jurisdictions still require wide clearance for their convenience in maintaining the lights, but this wide spacing greatly reduces tree canopy and is therefore discouraged. Spacing of 10 feet away from trees is generally adequate.
- An 8-foot minimum clearance must be maintained between accessible parking spaces and trees.
- Trees may be planted as close as 6 feet from bus shelters, where they provide welcoming shade at transit stops.

- Adequate clear space should be provided between trees and awnings, canopies, balconies, and signs so they will not come into conflict through normal growth or require excessive pruning to remediate such conflicts.
- Trees may be planted in medians that are 4 feet or wider, but must have an adequate clear height between the surface of the median and the lowest branches so that pedestrians can be seen. Where trees hang over the street, the clear height should be 14 feet.

UNDERSTORY LANDSCAPING

Understory landscaping refers to landscape elements beneath the tree canopy in areas within the public right-of-way not required for vehicular or pedestrian movement, including:

- Medians
- Curb extensions
- Furniture and frontage zones

Benefits of Understory Landscaping

- Complements and supports street trees, in particular by providing uncompacted, permeable areas that accommodate roots and provide air, water, and nutrients
- Reduces impervious area and surface runoff
- Treats stormwater, improving water quality
- Provides infiltration and groundwater recharge
- Provides habitat
- Reduces the perceived width of the street by breaking up wide expanses of paving, particularly when the understory is in medians and sidewalk furniture zones
- Contributes to traffic calming
- Provides a buffer between the walkway zone and the street, contributing to pedestrian comfort
- Improves the curb appeal of properties along the street, potentially increasing their value
- Enhances the visual quality of the community

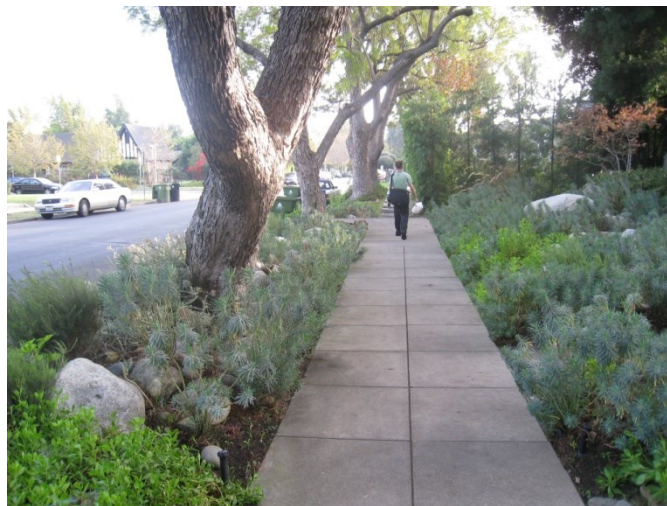
Principles

- Trees take precedence: the understory landscape should support them. It should not compete with them.
- Only pave where necessary: keep as much of the right-of-way unpaved and planted as possible to maximize benefits
- Design understory areas to infiltrate water
- The entire understory area does not have to be covered with plants—composted mulch is a good groundcover (top of mulch should be below adjoining hardscape so that runoff will flow into planting areas).
- Make the understory sustainable: use drought-tolerant plants

- Replenish the soil with compost
- Design the understory to contribute to the sense of place



*Traditional landscaping, requiring irrigation, along a residential parkway in Southern California
(Credit: Patricia Smith)*



*More sustainable landscaping in Southern California
(Credit: Patricia Smith)*

Guidelines

Soil

Provide good quality, uncompacted, permeable soil. Soil analyses should address the concentration of elements that may affect plant growth, such as pH, salinity, infiltration rate, etc. Remove and replace or amend soil as needed. Good preparation saves money in the long run because it reduces the need to replace plants, lowers water consumption, and reduces fertilizer applications.



*Landscaped parkway along a commercial street
(Credit: David Riesland)*

Design

Generally, understory landscaped areas should be as wide as possible where there are trees: when feasible, at least 6 to 9 feet wide for parkways and 8 to 12 feet wide for medians. However, many existing parkways and medians are less wide. Narrower parkways can support understory plants and some tree species. A path or multiple paths should be added as needed across a parkway as a means of access from the curb to the sidewalk. For example, where there are striped curbside parking spaces, a path across the parkway should be provided at every one or two parking spaces.



*Walking path across the parkway provides access from parked cars to sidewalk
(Credit: Patricia Smith)*

Plant with species that:

- Do not require mowing more frequently than once every few months
- Are drought tolerant and can survive with minimal irrigation upon establishment
- Do not exceed a height of 2 feet within 5 feet of a driveway/curb cut and within 20 feet of a crosswalk, and, excluding trees, 3 feet elsewhere
- Do not have thorns or sharp edges adjacent to any walkway or curb
- Are located at least 4 feet from any tree trunk

STREET FURNITURE

Street furnishings in the street environment add vitality to the pedestrian experience and recognize the importance of the pedestrian to the fabric of a vibrant urban environment. Street furnishings encourage use of the street by pedestrians and provide a more comfortable environment for non-motorized travel. They provide a functional service to the user and provide uniformity to the urban design. Street furnishings include benches and seating, bollards, flower stands, kiosks, news racks, public art, sidewalk restrooms, signs, refuse receptacles, parking meters, and other elements.

Street furnishings achieve improved vitality in many ways:

- They make walking, bicycling, and public transit more inviting.
- They improve the street economy and common city prosperity.
- They enhance public space and create a place for social interaction.

Placement of street furnishings should be provided:

- At concentrations of pedestrian activity (nodes, gathering areas)
- On streets with pedestrian-oriented destinations. Pedestrians may gather or linger and enjoy the public space.
- Site furnishing placement should follow these criteria:
 - Street furnishings are secondary to the layout of street trees and light standards as street trees and light standards develop a street rhythm and pattern. Site furnishing should be placed in relation to these elements sensitive to the vehicular flow and pedestrian use of these elements. Careful consideration to the placement provides ease of recognition and use.
 - In addition to the guidelines provided for each element, placement should adhere to the minimum spacing. Site furnishing installed within the appropriate zone will be spaced not less than as shown in Table 10.2.

Table 10.2 Site Furnishing Minimum Setbacks

Location	Setback
Face of Curb	18"
Driveway	2'
Wheelchair Ramp	2'
Ramp Landing	4'
Fire Hydrant	5'
Stand Pipe	2'
Transit Shelter	4'

- All site furnishing must be accessible per Public Rights-of-Way Accessibility Guidelines (PROWAG) and other city regulations.
- Cities should strive to include sustainable materials for street furnishings.

BENCHES AND SEATING

Public seating provides a comfortable, utilitarian, and active environment where people can rest, socialize, or read in a public space. The proper placement of a bench is a simple gesture creating a sense of place for the immediate area.



*Street bench
(Credit: David Riesland)*

Location

Seating arrangements should be located and configured according to the following guidelines:

- Seating should be located in a shaded area under trees.
- Seating should be oriented toward points of interest; this can be the adjacent building, an open space, or the street itself if it's lively. Where sidewalk width permits, seating can also be oriented perpendicular to the curb.
- Informal seating opportunities, incorporated into the adjacent building architecture, may be used as an alternative to free-standing benches. Low planter walls can be used as informal seating areas.

Design

Benches and seating should be made of durable high-quality materials. The seating design should complement and visually reinforce the design of the streetscape.

Seating opportunities should be integrated with other streetscape elements.

BOLLARDS

Bollards are primarily safety elements to separate pedestrians or other non-motorized traffic from vehicles. Thoughtful design and/or location of bollards can add interest, visually strengthen street character, and define pedestrian spaces.



Bollards
(Credit: David Riesland)

Location

Bollards are used to prevent vehicle access on sidewalks, or on other areas closed to motor vehicles.

Removable bollards should be placed at entrances to permanent or temporary street closures.

Design

Bollards range in size from 4 to 10 inches in diameter. Bollards should have articulated sides and tops to provide distinct design details. The details should be coordinated with other street elements of similar architectural character.

Removable bollards should be designed with a sturdy pipe projecting from the bottom of the exposed bollard. Removable bollards should appear permanent. Electrically controlled mechanisms retract the bollard into a void below the surrounding finish surface. This allows emergency vehicle access to closed streets.

STREET VENDOR STANDS



Street vendor stands, such as flower, magazine, and food vendor stands, rely on regular pedestrian traffic to sustain their business. To maximize efficiency, the stands operate during daytime work hours and cater to those commuting to/from employment areas. In areas with a vibrant evening environment, stands may have evening hours to benefit from the extended period of exposure to pedestrian traffic.

*Street vendor stand
(Credit: Sky Yim)*

Location

Generally, street vendor stands should either be located outside the street right-of-way or in the sidewalk, furniture, or frontage zones.

Design

The design of the street vendor stands should have details and features coordinated with other street elements. These details should be of a similar architectural character. The stands should allow a minimum of 6 feet of clear pedestrian passage between the edge of the display area and other elements.

INFORMATIONAL KIOSKS

Kiosks in public areas provide valuable information, such as maps, bulletin boards, and community announcements. Kiosks can often be combined with gateway signs and are an attractive and useful street feature.

Location

Kiosks may be located in any of the following areas:

- The sidewalk, furniture, or frontage zones
- Curb extensions
- Where parking is not allowed
- Close to, but not within transit stops

Kiosks should not block scenic views.



*Informational kiosk
(Credit: Paul Zykovsky)*

Design

Kiosks should be designed to the following guidelines:

- Kiosks should include bulletin boards or an enclosed case for display of information.
- As a gateway element, the kiosk should include the neighborhood, commercial district, street, or park name; a map; or other information.
- Kiosks should have details and features coordinated with other street elements and should have a similar architectural character.

NEWS RACKS

Location

News rack placement is subject to municipal guidelines. In addition, the following guidelines should be considered:

- News racks located within the furniture or frontage zones should not reduce the minimum width of the sidewalk pedestrian zone with news rack doors open.
- News racks should be placed no closer than 2 feet from adjacent street signs and 4 feet from bike racks.



*News rack
(Credit: Ryan Snyder)*

Design

News racks should visually blend with their surroundings and complement the architectural character. Multiple news racks should be consolidated into a standard decorative stand.

PARKING METERS

Parking meters can be either traditional single-space meters or consolidated multi-space meters (parking stations).

Location

Parking meters should be placed in the sidewalk furniture zone. Single-space meters should be placed at the front end of the individual stalls.

Multi-space meters should be placed every 8 to 10 parking spaces and spaced approximately 150 to 200 feet apart. Signs should clearly direct patrons to the meter. The signs should be spaced at approximately 100 feet on-center.

Design

The conversion of single-space meters to multi-space units can reduce visual clutter from the urban landscape. The multi-space units should be selected to minimize their impact on the pedestrian zone.

SIGNS

Streetscape signs provide information specific to direction, destination, or location. The sign plans should be developed individually for each neighborhood or district. Streetscape signs are most appropriate for downtown, commercial, or tourist-oriented locations or around large institutions. Streetscape signs include parking, directional, and wayfinding signs.



Street signs (Credit: Sky Yim)

Location

Streetscape signs should be placed strategically. They should align with the existing street furnishings and be placed in the sidewalk furniture zone.

The sign design should be attractively clean and simple and complement the architectural character of other street furnishings.

REFUSE RECEPTACLES

Refuse receptacles should accept both trash and recyclables. Where there is a demand, different receptacles should be provided for different recyclable materials.



*Refuse receptacle
(Credit: David Riesland)*

Location

Refuse receptacles should be located:

- Near high activity generators such as major civic and commercial destinations
- At transit stops
- Near street corners but outside of the sidewalk pedestrian zone

There should be a maximum of one refuse receptacle every 200 feet along commercial streets and a maximum of four refuse receptacles at an intersection (one per corner).

PUBLIC ART

On a large scale, public art can unify a district with a theme or identify a neighborhood gateway. At a pedestrian scale, public art adds visual interest to the street experience.



*Public art
(Credit: David Riesland)*

Location

Public art can be situated in a variety of areas and locations, including streets, public spaces with concentrations of pedestrians, or areas of little pedestrian traffic, to create a unique space for discovery.

Design

Public art should be considered during the planning and design phase of development to more closely integrate art with other streetscape elements, taking into account the following:

- Public art is a pedestrian amenity and should be presented in an area suited for pedestrian viewing. The piece should be placed as a focal element in a park or plaza, or situated along a pedestrian path and discovered by the traveler.
- Public art can be incorporated into standard street elements (light standards, benches, trash receptacles, utility boxes).
- Public art can provide information (maps, signs) or educational information (history, culture). All installations do not need to have an educational mission; art can be playful.
- Public art should be accessible to persons with disabilities and placement must not compromise the sidewalk pedestrian zone.

SIDEWALK DINING

Outdoor café and restaurant seating adjacent to the sidewalk activates the street environment and encourages economic development.



*Outdoor café seating: Utrecht, Holland
(Credit: Ryan Snyder)*

Location

Tables and chairs are to be placed on the sidewalk directly at the front of the restaurant and allowed in the frontage zone or furniture zone of the sidewalk where sufficient width is available.

Design

Placement of tables and chairs may, if possible, include diverters (barriers) at the end of the dining area to guide pedestrians away from the accepted area of sidewalk. If diverters cannot be accommodated, a through pedestrian zone of a minimum five foot width, without obstructions or physical barriers, must be provided. If alcohol is served, the Alcoholic Beverage Laws Enforcement requires that the restaurant have a positive barrier to separate the dining area from the through pedestrian zone.

OTHER STREETSCAPE FEATURES

Other features that enhance the pedestrian experience include clocks, towers, and fountains, which strengthen the sense of place and invite pedestrians to come enjoy.



Other example streetscape fixtures (Credit: Ryan Snyder)

UTILITIES

The location of underground and aboveground utilities must be considered when planning new landscaped areas in the right-of-way. Each jurisdiction should establish guidelines to organize and standardize utility location and to minimize conflicts between landscaping and utilities based on input from all affected departments and agencies.

The majority of underground utilities, including sanitary sewers and storm drains, and water, gas, and electrical mains, are typically located under the roadway. Sanitary sewers are often in the center of the street directly under the potential location of a landscaped median. They are usually relatively deep. In general, if they have at least 4 or 5 feet of cover, they should not be affected by the introduction of a landscaped median. The other utilities within the roadway are typically located closer to the curbs.

Telecommunications, street lighting conduit, traffic signal conduit, and fiber optic conduit are often located under the sidewalk. Lateral lines extend from the utility mains in the public rights-of-way to serve adjacent properties.

Benefits of well-organized utility design/placement include:

- Reduced clutter in the streetscape
- Increased opportunity for planting areas and for soil volume to support tree growth and stormwater infiltration
- Reduced maintenance conflicts
- Improved pedestrian safety and visual quality

GUIDELINES

Location

- Utilities should be placed to minimize disruption to pedestrian travel and to avoid ideal locations for directing stormwater, planting trees and other vegetation, and siting street furniture, while maintaining necessary access to the utilities for maintenance and emergencies.
- Utilities within 10 feet of where a landscaped median may be located should have at least 5 feet of cover.
- Utility main lines that run laterally under the sidewalk should be located in a predetermined zone to minimize conflicts with tree roots and planting areas. The ideal location to minimize conflicts with trees would be under the pedestrian or frontage zones, although the more practical location is often under the furniture zone. Stacking dry utilities (telephone, CATV, electric, etc.) in the pedestrian or frontage zones will further reduce conflicts with the landscaped area.

Roadway/Parking Lane

- Large utility vaults and conduits running the length of a city block may be located in the roadway or parking lane where access requirements allow. Vaults in the parking lane may be located in short-term parking zones or in front of driveways to facilitate

access. Each jurisdiction typically has specific design standards for vaults and utilities based on expected use and vehicle type. They can also be placed in midblock curb extensions.

Furniture Zone

- Small utility vaults, such as residential water vaults, residential water meters, gas valves, gas vaults, or street lighting access, should be located in the sidewalk furniture zone at the back of the curb wherever possible to minimize conflicts with existing or potential tree locations and landscaped areas. Vaults should be aligned or clustered wherever possible.
- Generally, utility boxes are sited in the direction of the pipe. Utility boxes that are parallel with the curb should be located in the sidewalk furniture zone when possible. Vaults perpendicular to the curb should be located between existing or potential street trees or sidewalk landscape locations (for example, in walkways through the sidewalk furniture zone to parked cars).
- Utility laterals should not run directly under landscaped areas in the furniture zone, but instead under driveways and walkways wherever possible.

Sidewalk Pedestrian Zone

- Flush utility vaults and conduits running the length of the city block may be located in the pedestrian zone. Vaults in the pedestrian zone should have slip-resistant covers.
- Large flush utility vaults should be placed at least 3 feet from the building and 4 feet from the curb where sidewalk widths allow.
- Surface-mounted utilities should not be located in the pedestrian zone.

Sidewalk Frontage Zone

- Utility vaults and valves may be placed in the frontage zone. Placement of utility structures in this zone is preferred only when incorporating utility vaults into the furniture zone is not feasible.
- Utility vaults in the frontage zone should not be located directly in front of building entrances.

Curb Extensions

- Utility vaults and valves should be minimized in curb extensions where plantings or street furnishings are planned.
- Surface-mounted utilities may be located in curb extensions outside of crossings and curb ramp areas to create greater pedestrian through width.
- Utility mains located in the parking lane and laterals accessing properties may pass under curb extensions. With curb extensions or sidewalk widenings, utilities such as water mains, meters, and sewer vents may remain in place as they can be cost prohibitive to move.

Driveways

- Utility boxes may be located in driveways if the sponsor provides a vehicle-rated box; however, this is not a preferred solution due to access difficulties.

Pedestrian Crossings and Curb Ramps

- New utility structures should not be placed within street crossing and curb ramp areas.
- Existing vaults located in the center accessible portion of a ramp should be moved or modified to meet accessibility requirements, as feasible, as part of utility upgrades.
- Catch basins and surface flow lines associated with storm drainage systems should be located away from the crosswalk or between curb ramps. Catch basins should be located upstream of curb ramps to prevent ponding at the bottom of the ramp.

Consolidation

Utilities should be consolidated for efficiencies and to minimize disruption to the streetscape:

- Dry utility lines and conduits (telephone, CATV, electric, gas, etc.) should be initially aligned, rearranged, or vertically stacked to minimize utility zones.
- Wherever possible, utility conduits, valves, and vaults (e.g., electrical, street lighting, and traffic signals) should be consolidated if multiple lines exist within a single street or sidewalk section.
- Dry utilities (gas, telephone, CATV, primary and secondary electric, streetlights) may use shared vaults wherever possible.
- Street lighting, traffic signal, and light rail or streetcar catenary poles should share poles wherever possible. When retrofitting existing streets or creating new streets, pursue opportunities to combine these poles.



*Artfully painted utility box
(Credit: Sky Yim)*

Other Design Guidelines

- Street design and new development should consider the overall pattern of plantings, lighting, and furnishings when placing new utilities in the street, and locate utility lines so as to minimize disruption to the prevailing streetscape rhythms.
- Utilities should be located underground wherever possible, as opposed to overhead or surface-mounted. Overhead utilities should be located in alleys where possible.
- New utilities should use durable pipe materials that are resistant to damage by tree roots and have minimal joints.
- Trenchless technologies, such as moling and tunneling, should be used wherever possible to avoid excavation and disruption of streetscape elements.
- New infrastructure projects should use resource-efficient utility materials. Re-used or recyclable materials should be incorporated wherever possible.
- Utility boxes may be painted as part of a public art program.
- Tree removal should be avoided and minimized during the routing of large-scale utility undergrounding projects.
- Any utility-related roadway or sidewalk work should replace paving material in kind (e.g., brick for brick) where removed during maintenance, or replace with new upgraded paving materials.

New Development and Major Redevelopment

- Alleys for vehicle, utility, and service access should be incorporated to enable a more consistent streetscape and minimize above-ground utilities.
- New utilities should be located to minimize disruption to streetscape elements per guidelines in this section.

Abandonment

- Currently abandoned dry conduits should be reused or consolidated if duplicate lines are discovered during street improvement projects. Utilities should be contacted for rerouting or consolidation. Where it is not possible to reuse abandoned mains, conduits, manholes, laterals, valves, etc., they should be removed per agency recommendations when possible to minimize future conflicts.
- Abandoned water and sewer lines may be retrofitted as dry utility conduits where available or if possible to minimize the need for future conduit installations.

Process

- Utility installation and repair should be coordinated with planned street reconstruction or major streetscape improvements.
- New development should submit utility plans with initial development proposals so that utilities may be sited to minimize interference with potential locations for streetscape elements.
- Utility work also offers opportunities to make other changes to the street after the work is completed and should be coordinated with planned improvements to avoid duplication of efforts or making new cuts in new pavement. Examples of improvements to streets done at low cost after utility work include restriping for bike lanes if utility work requires total street repaving, as well as building sidewalks in conjunction with utility work occurring outside the traveled way.

Lighting

Lighting provides essential nighttime illumination to support pedestrian activity and safety as well as vehicle safety. Well-designed street lighting enhances the public realm while providing safety and security on roadways, bike paths, and bike lanes as well as pedestrian paths including sidewalks, paths, alleys, and stairways.

Historically significant street light poles and fixtures should be maintained and upgraded where appropriate.

Pedestrian lighting should be coordinated with building and property owners to provide lighting attached to buildings for sidewalks, alleys, pedestrian paths, and stairways where separate lighting poles are not feasible or appropriate.



Street lamps (Credit: David Riesland)

Guidelines

Location and Spacing

1. Street and pedestrian lighting should be installed in the sidewalk furniture zone;
2. Light fixtures should not be located next to tree canopies that may block the light; and
3. Where pedestrian lighting is not provided on the street light pole, special pedestrian lamps should be located between street light poles.

Light Color

All light sources should provide a warm white (yellow, not blue) color light.

Light Poles and Fixtures

Design should relate and be coordinated with the design of other streetscape elements and recognize the history and distinction of the neighborhoods where the light poles are located.

Lighting to Minimize Light Pollution

As appropriate, full cut-off lighting fixtures should be selected to minimize light pollution cast into the sky while maximizing light cast onto the ground.



*LED Light Fixtures at Night: Norman, OK
(Credit: Michelle Rudder)*

Energy Efficiency

New and more efficient lighting technologies should be utilized where possible, including LED, for new installations or for retrofit projects.

Pedestrian Lighting

Retrofits of existing street lights and new installations should provide lighting on pedestrian paths. Pedestrian lighting should be added to existing street light poles where feasible unless spacing between street light poles does not support adequate pedestrian lighting, in which case pedestrian lighting may need to be provided between existing street light poles.

Light Levels and Uniformity

All optic systems should be cut off with no light trespass into the windows of residential units. The City of Norman has adopted the Roadway Lighting Design Guide published by the American Association of State Highway and Transportation Officials in order to achieve adequate lighting levels for all users.

ADDITIONAL SELECT RESOURCES

Lancaster, B. Rainwater Harvesting for Drylands and Beyond,
<http://www.harvestingrainwater.com/>.

Landscape Architecture Foundation's Landscape Performance Series,
www.lafoundation.org/lps.

11. RE-PLACING STREETS: PUTTING THE PLACE BACK IN STREETS

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INTRODUCTION

Most American cities have come to view streets primarily as conduits for moving vehicles from one place to another (from A to B is the common expression). While moving vehicles is one of their purposes, streets are spaces, even destinations in and of themselves. Conceiving of a street as a public space and establishing design guidelines that serve multiple social functions involves several fundamental steps. Behind them all is a redefinition of whom streets ought to serve. By approaching streets as public spaces, cities redirect their attention from creating traffic conduits to designing a place for the people who use the street. People put the place back in streets.



*Pavement to Parks program: San Francisco, CA
(Credit: Sky Yim)*

This chapter describes the need for cities to “re-place” their streets—make streets places and refocus their purpose on the people who use them—and how cities can do so. The chapter outlines the key features and functions of re-placed streets and the design elements used to achieve re-placed streets. The chapter concludes by describing the process cities can follow to ensure streets come to reflect a community’s strengths, needs, and aspirations.

PUBLIC SPACE AND THE NEED TO RE-PLACE STREETS

Public spaces are the stages for our public lives. They are the places shared by all members of a community, of any size. Quality public spaces are places where things happen and where people want to be, vital places that highlight local assets, spur rejuvenation, and serve common needs.

Streets comprise a large portion of publicly owned land in cities and towns. Streets are a huge part of any community’s public space network, and historically served as meeting places, playgrounds for children, marketplaces, and more. As populations spread out from city centers, streets lost many of these functions and were instead designed and planned for one use: mobility. At best, streets conceived as complete streets address the mobility needs of all street users (pedestrians, cyclists, drivers, and transit riders). During the last century, however, automobiles have been prioritized over people as users of our streets.



*Active public space: London, England
(Credit: Ryan Snyder)*

As part of the public realm, successful streets have a variety of functions beyond allowing automobiles to travel rapidly. For this reason, placemaking, the process of creating high-quality destinations, must be at the core of the planning and design of our streets to meet the following challenges:

- **Population growth and urbanization.** People moving back into cities will need to be accommodated in limited space, putting greater demands on existing streets. If streets continue to largely function to move people traveling in motor vehicles, they will not be able to accommodate this growth. Streets will need to enable people to do more while traveling less and to travel more efficiently.
- **The need to maximize social and economic exchange.** Streets will need to serve the highest and best use for the land they are on, and mobility is only one among many possible uses. Streets need to be designed to maximize social value, which also spurs healthy economic exchange. In this way, streets become arteries distributing prosperity. Streets that invite social interaction are more likely to ensure healthy growth.
- **The need to reduce energy consumption and induce sustainable growth.** Streets that are places promote locality by enabling people to travel comfortably using non-motorized modes. This in turn shortens travel distance demand. With growing concerns regarding fuel resources and climate change, this shift will be critical. Because re-placed streets spur locality-serving commerce and social venues, they also set the stage for and enable healthy and environmentally sustainable practices/behaviors in the surrounding built environment.
- **A desire to create public space.** Beyond being the frames for other development, streets can be public spaces themselves. Access to public space is critical to safe, healthy, and successful communities. When streets are designed as great spaces for people, they reinforce a sense of belonging and build on the strengths of the communities they host.

PLACEMAKING FOR STREETS

In order to be places, streets must:

- Augment and complement surrounding destinations, including other public spaces such as parks and plazas
- Reflect a community's identity
- Invite physical activity through allowing and encouraging active transportation and recreation
- Support social connectivity
- Promote social and economic equity
- Be as pleasant and accessible for staying as for going
- Prioritize the slowest users over the fastest
- Balance mobility and public space functions

So that people can:

- Walk and stroll in comfort
- Sit down in nice, comfortable places, sheltered from the elements
- Meet and talk—by chance and by design
- Look at attractive things along the way
- See places that are interesting
- Feel safe in a public environment
- Enjoy other people around them
- And get where they need to go!

Re-placed streets must be slow streets that are inviting and filled with human activity. This is the most important distinction between streets designed for maximal car throughput and re-placed streets; it requires the necessary adjustment from car to people-focused street planning. Streets designed for fast and far movement favor people moving by motor vehicles, not people moving under their own power. Human energy limits people to slow and local movement.

Because people, not motors, are essential to long-term growth in places of all kinds, human-scaled streets are an inducement to healthy lifestyles and economic resilience.



*Public plaza: Barcelona, Spain
(Credit: Ryan Snyder)*



(Credit: David Riesman)



*Good public space invites social interaction
(Credit: Dan Burden)*

DESIGN TECHNIQUES AND GOALS FOR REPLACED STREETS

A re-placed street balances the moving and staying needs of its users and has multiple, people-serving purposes. The design techniques and goals detailed below describe how to create re-placed streets.

Support and Encourage Activities and Destinations

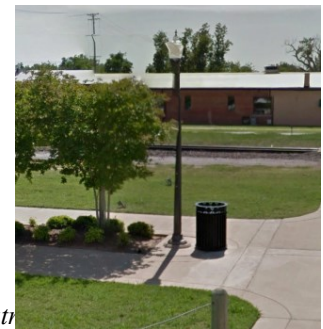
- Widen sidewalks to accommodate multiple activities
- Open streets to multiple activities
- Encourage/provide active ground floor uses in adjacent buildings
- Cluster activities and amenities
- Allow street vendors and performers



Street performer (Credit: Ryan Snyder)

Design Street Elements and Adjacent Buildings for the Human Scale

- Use amenities that are pedestrian-scaled including:
 - Signs
 - Lighting
 - Seating
- Encourage building design (e.g., through zoning regulations and design guidelines) that is scaled to the human body, such as:
 - Frequent building entrances
 - Building transparency at street level
 - Interesting facades



Pedestrian-scaled street (Credit: David Riesland) OK



*Walk streets used as play space:
Manhattan Beach, CA (Credit: Dan Burden)*



*Transparent storefronts blur the distinction between
indoor and outdoor space, and public and private space:
Avalon, CA (Credit: Ryan Snyder)*

Provide a Feeling of Safety and Security on Streets

- Keep streets well-maintained and both the street and surrounding buildings well-lit
- Select streets adjacent to round-the-clock-active buildings and public spaces
- Invite diverse people and uses throughout the day
- Slow traffic to a comfortable speed to mix with other travel modes through:
 - Low speed design elements
 - Traffic calming techniques
 - Shared space
- Maintain a buffer between pedestrians and vehicles when there is fast moving traffic using:
 - Planters
 - Bollards
 - Parked cars
 - Kiosks, newsstands, public toilets, lampposts



*Good sidewalk buffer: Norman, OK
(Credit: David Riesland)*



*Shared space: Zurich, Switzerland
(Credit: Ryan Snyder)*

Connect Both Sides of the Street

- Shorten crossing distance through:
 - Narrow travel lanes
 - Curb extensions and pedestrian islands
 - Building activities connected to the street
- Invite people to cross in more places by:
 - Slowing vehicular traffic
 - Establishing mid-block crossings
 - Making shared streets



Farmer's market (Credit: Dan Burden)

Show a Sense of Ownership

- Provide for maintenance and cleanliness
- Engage community/local residents in maintenance
- Accommodate diverse programming appropriate for the season and time-of-day, such as:
 - Greenmarkets/farmers' markets
 - Fairs and festivals
 - Ciclovía-style events
 - Volunteer events



CicLAvia: Los Angeles, CA (Credit: Ryan Snyder)

Reflect Community Identity

Unique community identity draws from the natural setting and local history, as well as the cultural backgrounds of community residents and their architectural tastes.

- Showcase local assets including:
 - Monuments and building architecture
 - Views
 - Trees and other plants
 - Other natural features (water, topography)
 - Parks and plazas
 - History
 - People
 - Intersections transformed into meeting places
- Invite a diversity of users
- Reference or preserve continuity of local aesthetics



Statue: Santa Fe, NM (Credit: Ryan Snyder)

Move Community towards Local Sustainability

- Utilize on-site and local resources where possible
- Use surface area for energy capture
- Use effective stormwater management techniques including bioswales and raingardens
- Use open space for growing food (community gardens)

STRATEGIES TO RE-PLACE STREETS

Re-placing streets requires building streets around a community's vision that the street can support. Re-placing a street is an opportunity to open a process wherein communities remind themselves of their strengths and establish a shared and sustainable vision for their future. Before a city can proceed with street redesigns that create a sense of place, it must address the following issues.

THE STREET'S PLACE IN THE COMMUNITY

Streets, the built environments they connect, and the people who use them compose a community. Thus, it is important to situate the street in its spatial context and identify the places it connects. It is equally important to identify whose needs the street should serve. This may include tenants and property owners, students, employees, local civic associations, and religious institutions.

PLACEMAKING PARTICIPANTS

At the heart of placemaking is the idea that each community has the means and the potential to create its own public spaces. Before proceeding with street redesigns that attend to the multiple functions of public space through placemaking, it is important to identify who needs to be involved to frame the meaning of place and the vision and to provide the needed information, resources, and expertise to realize that vision.

The Community

Since place is an outgrowth of community character, re-placing should invite the collective influence of a community's diverse residents and users. In re-placing a street, it is important to establish who has a stake in the neighborhood, and give all of these groups and individuals the opportunity to come to the table and contribute. As noted above, the groups may include tenants and property owners, students, employees, and community-based groups like civic associations and religious institutions. The appropriate public space functions of streets should be defined by these multiple users, often referred to as "stakeholders."

Multiple Agencies

Within a city, multiple agencies should be included and engaged in re-placing a street. A department of transportation alone cannot create a street that is a place. Any agency with responsibility for the regulation, construction, operations, or maintenance on or adjacent to the street should be included in the project early in the process. In addition to the department of transportation, this might include public works, the parks department, utilities, and the planning or zoning department. All agencies must bring their needs and constraints to the table, but more importantly they must understand the community's vision and goals for making the street a place. They can then begin considering what they need to do to carry out the will of their community.

A Multi-Disciplinary Team

A successful street is a complex place, and the information, insight, and skills required to make it a successful place are many and diverse. It is beyond the experience of any one profession to deal with any of these issues. The role of professionals is as a resource for the community and to implement the community's vision.

THE PLACEMAKING PROCESS

The placemaking process should be fun, engaging, and empowering for a community; build on existing human resources; and result in increased community social capital. Chapter 14, "Community Engagement," provides the details of the type of public process that should be used to ensure community involvement and place-based planning. Below are processes especially important to placemaking.

Establish a Community Vision of What the Street Is and Should Be

Infrastructure forecasts what later springs from the built environment: a street's public space functions can influence a community's growth aspirations and not just accommodate existing behavior. Determining the optimal uses and design for a given community's streets involves identifying the strengths and needs of its users. Because it involves an adjustment in scale, this is the most important distinction between a street designed to be a place, with many functions, and a street designed for the single function of maximizing car throughput. A process that allows the community of street users to define these strengths and needs and establish a vision for the street is critical.

Involve the Public in Assessing the Strength, Needs and Opportunities on the Street

The project must start by going directly to the residents and neighborhoods to evaluate and establish a vision for the street. A critical part of this will be an assessment of whether places on the street are performing well or need improvement. The assessment should include a grassroots identification of needs for enhancement of underperforming places and opportunities for the creation of new places so that the street can achieve the critical mass of places needed to function as a destination itself. In addition to places on the street, the community should be engaged in an on-site diagnosis of the street itself to determine how it is performing. A variety of tools and audits exist for such assessments, but the community should be engaged in assessing the characteristics, described in the previous section, that make a street a place.

Establish a Community Vision Based on This Assessment

The community process should result in a community-generated vision for what the street can and should be, including the things people should be able to do on the street and the way that people feel doing them. The vision should be generated by people who use the street. Such a vision is generally quite realistic and practical yet contains innovative ideas because the vision is grounded in reality but isn't generated by just one individual or group.

The vision should contain:

- A mission statement of goals
- A definition of how the street will be used and by whom
- A statement of the desired character of the street
- Suggestions and a conceptual idea of how the street could be designed
- Models or examples of places that community members would like the street to be like or elements they would like to use

Develop a Plan Based on This Vision

There will need to be a plan for realizing the vision. It might not include every step to realize the vision, but it should begin to lay out next steps and identify things that all partners, including the agencies, the professionals, and the community, can do to move re-placing the street forward.

Prioritize Interventions Based on This Vision

The vision will contain many ideas. However, some will be more important or more critical than others. Additionally, some will be easier to implement than others. The community will need to prioritize individual ideas and strategies in order to begin to take action in re-placing the street.

Select and Implement Short-Term/Temporary/Pilot Projects

First on the action plan should be short-term or pilot projects. Such projects can be a way of testing ideas for long term change at a lower cost while providing flexibility for adaptation and change. Such projects also give people confidence that change is occurring and that the ideas they have contributed matter. This is important because re-placing streets takes time, and smaller, simpler changes can provide small steps that keep people engaged in the process of placemaking. Short-term and pilot projects allow people to see how the street is working with changes introduced gradually over time, enabling people's perceptions of how the street functions and what it should be to change and reducing resistance to change.



Examples of low-cost, short-term devices that transform streets: San Francisco, CA (Credit: Sky Yim)

New York, San Francisco, Portland, and other cities have quickly transformed streets into vibrant public space with such techniques as:

- Establishing non-vehicular space with planter boxes, temporary curbs, and wooden platforms
- Painting the pavement under the newly repurposed space
- Bringing in portable tables, chairs, and awnings
- Incorporating decorative street painting projects



*Examples of low-cost, short-term devices that transform streets:
Broadway, New York, New York (Credit: Paul Zykovsky)*

Establish a Maintenance and Management Plan

Maintenance and management is critical because streets are not static—they change daily, weekly, and seasonally—and streets must adapt and be flexible to this change. Thus, public space management may be required. Management becomes especially critical where events, such as farmers' markets, fairs, festivals, and *ciclovías*, are programmed. Great streets are also well loved and well used. To sustain a quality street environment, the community must commit to long-term investment in the re-placed street.

12. DESIGNING LAND USE ALONG LIVING STREETS

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INTRODUCTION

Streets provide access to buildings and land uses of every kind. As discussed in Chapter 11, “Re-Placing Streets,” placemaking is the practice of first designing streets and other public spaces as an interconnected network of human-scale “public living rooms” in which the safety and comfort of pedestrians and bicyclists is not subordinated to the requirements of access by automobile, and then coordinating the character and design of the adjoining properties to create a specific type of living environment, or place.



*Complementary land-use and street design
(Credit: Dan Burden)*

All successful and sustainable communities include a range of distinct and different types of places, or environments, from quiet, shady residential streets to busy neighborhood centers, from noisier mixed-use “bright lights” downtowns to larger, single-purpose industrial and employment centers. While the type of land use is one important characteristic of private property design in these places, site and building design are critically important in ensuring that coherent, safe, functional, and valuable places result.

This chapter provides a discussion of the ways in which the planning and design of properties contribute to coherent placemaking. The discussion includes placemaking principles that are applicable to places of all types and to distinct types of places, design techniques for applying the basic placemaking principles, and implementation strategies for embedding these principles and techniques in local policies and regulations.

ESSENTIAL PRINCIPLES FOR BALANCED STREET ENVIRONMENTS

The following design principles inform the recommendations made in this chapter and should be incorporated into all street environment design:

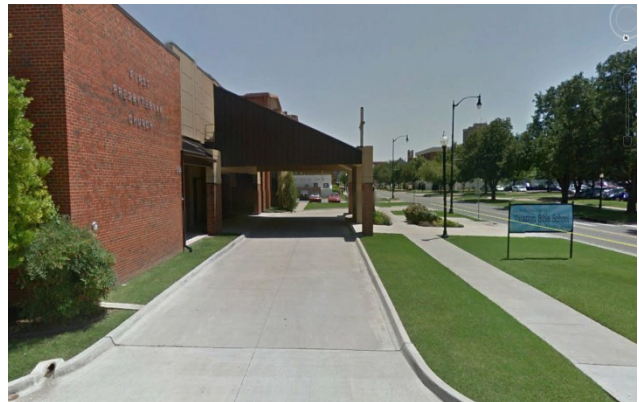
- Urban patterns in livable, sustainable places of enduring value are generally based on compactness, connectivity, completeness, and continuity. This describes the opposite of sprawling, disconnected, or single-use development.
- Streets are the outdoor rooms of their neighborhoods, and should be designed



*Neighborhood public square
integration: Buenos Aires, Argentina
(Credit: Ryan Snyder)*

for and scaled for people. They are also the structural framework that organizes those places, making them legible and navigable.

- The purpose of streets is to let people move about, and every street should provide safety, convenience, and comfort for pedestrians and bicyclists.
- Streets, parks, plazas, squares, and other public places make up the public space network in which all members of the community may encounter one another in the course of their daily lives, regardless of their age, income, or other individual status.
- Street networks designed with pedestrians in mind, as described in Chapter 2, “Street Networks and Classifications,” naturally form small to medium-sized blocks that allow pedestrians to comfortably walk to a range of amenities as a pleasant and practical alternative to driving. In existing environments where such a network exists it should be preserved, and in areas where large parcels are being redeveloped, such a network should be inserted.
- The distribution of land uses should be designed to allow everyday destinations (e.g., schools, parks, and retail shops) to be located within a comfortable walking distance of most residences.
- All buildings should contribute to the character of the streetscape, face the street with attractive entrances that welcome pedestrians, and have windows that overlook the street to create a sense of security.
- On-street parking reinforces a pattern in which visitors enter buildings from the street, and can provide an important buffer between pedestrians and moving traffic.
- The setback between buildings and the sidewalk should be designed to enhance the pedestrian experience, whether setbacks are attractive landscaped yards that provide privacy for building occupants or shopfronts at the sidewalk that display merchandise to passing pedestrians. In no cases should cars, parked or moving, be placed between the sidewalk and the buildings.
- Off-street parking and service access and their driveways should be designed to disrupt the pedestrian experience as little as possible. Whenever possible, access should be from an alley or shared driveway off a side street and parking and garages should be located behind or beside buildings, not between the sidewalk and the building. When a driveway to the front of the lot cannot be avoided, it should be as narrow as possible.
- Off-street parking, especially surface parking, is a non-productive use, and the amount required should be reduced to the extent possible by utilizing on-street parking and by sharing off-street parking among adjacent uses. Off-street parking requires about twice the surface area per parked car of on-street parking, due to the driveways required to access the lot and aisles needed for maneuvering within the lot. This non-productive space creates dead zones and increases the distances between destinations, further reducing the attractiveness of walking.



Good building setback (Credit: David Riesland)

- The mix and intensity of land uses should be designed to support and be supported by efficient transit systems whenever possible.

STREETSCAPE ENVIRONMENT TYPES

Every city, town, neighborhood and district is unique. This uniqueness creates a sense of place. However, there are a few general types of places that repeat from community to community, within which the idealized relationship of street to adjacent land uses follows certain general guidelines. The following descriptions of archetypical environments detail concepts and strategies, not finite design solutions. Designs should be based on the best of the local and regional architectural and landscape heritage.

NEIGHBORHOODS

Neighborhoods are the main component of all cities, the places where almost everyone lives. Many of the concepts below are part of the best loved and most valuable neighborhoods, and some of the best new neighborhoods now being built are based on these simple concepts:

- Residences of various types are the predominant land use of neighborhoods, with other uses such as neighborhood-serving retail, small businesses, elementary schools, parks, and playgrounds within a pleasant walk.
- Neighborhoods can be composed primarily or even exclusively of single family homes, or can include a range of multifamily housing types that are designed and scaled for their compatibility with houses. The basic design principles listed here are the same for both.
- Neighborhood streets are the living rooms and play rooms of the neighborhood, and should be designed mainly for the safety and enjoyment of pedestrians, particularly children and the elderly, the most vulnerable pedestrians among us.
- The streetscape environment of neighborhoods is the most heavily landscaped type, with sidewalks flanked by street trees and landscaped parkway strips on the public side and landscaped front yards on the private. This creates a distinctive streetscape character different from that in neighborhood centers and other mixed-use environments.
- On-street parking serves visitors and residents, and provides a valuable buffer between pedestrians, children at play, and passing traffic.



*Streets and buildings working together
create attractive neighborhoods
(Credit: Ryan Snyder)*

- Buildings should front the street with gracious front doors and overlook the street with windows to provide eyes on the street and a sense of security for the street.
- Front yard design should create spaces through which residents and visitors come and go in their daily routines, in which neighbors interact and children play, and where food can be grown.
- The front door of houses and active uses within them should be closer to the street than the garage to emphasize the home over car storage and to bring eyes closer to the street.
- Automobiles should disrupt the pedestrian environment (primarily sidewalks) as little as possible. This can be accomplished by providing access to parking and garages via alleys and driveways from side streets, or when necessary via driveways from the fronts of lots (as few and as narrow as possible) to access garages located behind or beside, not in front of, the residences.

NEIGHBORHOOD CENTERS

Neighborhood centers take many forms and occur at all scales, from a country store at a key intersection in a rural neighborhood to a busy little “Main Street” environment in a larger town or city to a high intensity, transit-oriented center at a neighborhood edge along a major urban corridor. Regardless of the scale and character of the neighborhood center, the following set of basic design concepts can define centers that are convenient to pedestrians from adjoining neighborhoods:



*Neighborhood center: Glendale, CA
(Credit: Ryan Snyder)*

- Neighborhood centers, the name notwithstanding, are generally at the edges or corners of neighborhoods, facing a major street or streets that carry traffic volumes capable of supporting the businesses. An ideal arrangement is a “Main Street” that is located at the conjunction of two or more neighborhoods, making the edges of the neighborhoods into the center of the larger community, and providing a range of amenities and resources within easy walking and biking distance of the residents.
- Neighborhood centers are ideally mixed-use, providing an array of goods, services, employment, and residential options that can function both as an extension of the adjoining neighborhoods and as a convenient destination for people passing through.
- The buildings of these centers should face the primary street, creating a busy pedestrian environment that causes drivers to slow down and see what the center has to offer.
- The ground floor uses in neighborhood centers are generally commercial, providing convenient goods and services to customers; the upper floors can be residential, office, or a mix of both.

- The streetscape in neighborhood centers is usually quite formal: street trees are normally located in small planters within the sidewalk, surrounded by tree grates or very small landscaped areas, providing space for pedestrians to comfortably stroll, and for people to get in and out of cars parked curbside.
- There are many options for the design of setback areas in neighborhood centers, including forecourts with sidewalk dining, narrow landscape zones that soften the streetscape while allowing views of the shops, and simple shopfronts built right to the sidewalk.
- Neighborhood centers can also include purely residential buildings, as long as the design of the ground floor street interface provides a degree of privacy for the residents, either by setting the building back behind a landscaped yard or raising the ground floor above the sidewalk level, or both.
- Except for the smallest centers, which might just be one corner store, neighborhood centers generally require off-street parking, which should be located behind or alongside the buildings whenever possible, not between the sidewalk and the buildings.
- In larger neighborhood centers that require large off-street parking lots, the size of the lots can be reduced if they are shared by uses whose peak parking demand is in the daytime (offices) and uses whose peak use is at night (e.g., dinner restaurants and residences). Reducing parking saves cost, improves environmental performance, and improves the urban environment for people.
- Plazas can create vibrant urban centers. Their design should focus on proper size and scale, active uses, doors and windows fronting the plaza, trees, landscaping, public art, fountains, etc. Stages, bandstands, play fountains, and other features “liven” plazas.

CORRIDORS

This section focuses on major street corridors that connect across an urban area. Corridors can have many different characters and occur at all scales, from a rural main street stop along a highway to a main avenue within a town or a high intensity urban corridor in a large city. Many planning and design concepts are common to corridors at all these scales.

Many major street corridors began as rural roads, evolved into automobile thoroughfares lined with a range of commercial uses, and have lately been losing much of their commercial value, as retail and office uses have migrated to larger-format retail centers and business parks. Many such corridors now present a significant opportunity for communities to provide infill housing mixed with modest amounts of commercial uses within walking distance of adjoining neighborhoods.



*Mixed-use building: Los Angeles, CA
(Credit: Ryan Snyder)*

The repositioning of these often blighted “commercial strips” as more valuable mixed-use places requires a coordinated redesign of the streets and careful planning of the infill development along the corridor.

The street design principles and practices described in this manual will help create streets that do more than move cars. Using these principles and practices, undifferentiated miles of corridors can be restructured to provide the types of neighborhood centers described above, interspersed with residential or office uses along the street. The core placemaking strategies found in this manual (slowing cars, planning for people, landscaping streets, providing on-street parking, and designing property setbacks to modulate privacy for residences and visibility for businesses) can transform miles of sameness into a sequence of useful places.

Below are of some core design concepts and principles that can help to integrate land uses with such streets to make coherent, human-scale places:

- The entire length of a corridor should be lined with active uses. These can include the neighborhood centers described above at appropriate nodes, multifamily housing of various types, and even single-family housing if appropriately buffered with landscaped setbacks or a multi-way boulevard. Sound walls, berms, and other forms of “pure buffer” are an admission of urban design failure, disconnecting the city rather than connecting it, and should be employed as a last resort.
- Through a community visioning process integrated with transit planning processes and retail capacity studies, the location and size of neighborhood centers (active, mixed-use, and often transit-oriented nodes) should be determined.
- Long corridors should be analyzed to define the existing or emerging character by segment, then potential nodes, centers or destinations with more focused pedestrian activity can be identified.
- A mix of land uses can be provided to encourage people to make trips by means other than cars in those locations, and a network of streets to assure connections between uses should be available.
- Design standards or guidelines for development within the segments that will remain auto-oriented should be created so these segments can be made as pedestrian and bicycle-friendly as possible (e.g., minimizing the number of curb cut locations and widths that interrupt the sidewalk, buffering street-frontage parking so the sidewalk environment is not compromised, providing setbacks for landscaping and transit amenities wherever possible to encourage transit use).



*Blank walls and inactive uses on the ground floor make for poor pedestrian environments
(Credit: Ryan Snyder)*

- In close consultation with the residents of adjoining neighborhoods, the vision and standards for the design and massing of buildings in each segment of the corridor should be developed.

URBAN CENTERS

Urban centers are typically the economic and social hearts of cities or towns. They can be



Urban center: Vancouver, BC (Credit: Dan Burden)

village-scale centers in small towns, low to mid-rise downtowns in most cities, or high intensity urban centers with high-rise buildings in larger cities, where unique regional destinations are often located. Ideally, the urban center environment is a very compact mix of a wide range of land uses, creating high land values as well as a high potential for transportation congestion. Accordingly, it is vitally important that in addition to a balanced street network for pedestrians, bikes, and cars, such

places be provided with high levels of transit service. Important design concepts for urban centers include the following:

- Urban centers are usually organized around an established network of major boulevards and urban streets that support the businesses and major public institutions. Because networks that are scaled and designed for pedestrians are finite in their traffic carrying capacity, it is critical that transit plays a major role in moving people.
- Urban centers are mixed in use, providing an array of goods, services, employment, and residential options along with important public and cultural institutions.
- Buildings in urban centers should face the primary street (which can often be more than one side of a block), and support an active pedestrian environment.
- Buildings in large urban centers should form a consistent street wall (following a consistent pattern of setback and height); the street wall is typically at the back of a wide sidewalk and appropriate to the character of the street it fronts.
- Along streets with purely residential buildings, the design of the ground floor-street interface should provide a degree of privacy for the residents, with residences normally set back from and raised above the sidewalk.
- Commercial uses generally front the sidewalk with large, transparent shopfronts, but some institutional and office uses commonly connect to the sidewalk environment with lobbies and foyers instead. In such cases, it is important that windows from the offices and other interior spaces overlook the street to support an environment that feels safe.

- For hotels and office buildings that require porte-cochere or drop-off areas for residents or guests, these should ideally be designed to occur at the street edge along the curb zone, and should not impose large curb cuts and circular driveways that interrupt the sidewalk. When such off-street vehicular access must be provided, it should be integrated into a forecourt or entry plaza that is designed first as a public space for people, and incidentally allows vehicular access that does not disrupt the pedestrian environment. The width of the pedestrian zone should be maintained throughout; the furniture and/or frontage zones can be reduced.
- Parking in urban centers should include:
 - On-street parking to buffer pedestrians from faster moving traffic
 - Shared, aggregated parking that is located underground wherever possible
- Above-grade structured parking should be lined with ground floor active uses that front the streets, not exposed or hidden with blank walls. This also applies to upper floors, where stacking exposed parking levels above the street-level commercial uses should be avoided.



*Well screened surface parking: Santa Barbara, CA
(Credit: Paul Zykovsky)*

Where surface parking lots are unavoidable, they should be behind a building that fronts the sidewalk and public street, or at a minimum screened with attractive landscape or public art to provide a comfortable street edge for passing pedestrians. Vendor kiosks or “slim stores” can also be used for this purpose.

- The key to district parking strategies is creating a supply of available parking that is shared by many uses, whose peak parking demands will be at different times of the day and the week. This, together with a strong transit component and an attractive walking and biking environment, will reduce the required amounts of parking, which in turn will save cost, increase real estate utilization, improve environmental performance, and improve the urban environment for people.

SPECIAL USE DISTRICTS

Special use districts are areas dominated by a single type of land use. One example of this is industrial districts, where manufacturing, production, and distribution of goods are the primary activities. Other examples are employment centers that primarily provide high concentrations of commercial offices, medical centers, and large education campuses. Such districts benefit from a location that provides easy access to regional roads and highways, and the sizes of their buildings, the volumes of truck traffic, and the hours of operation make them generally unsuitable for residential uses.

It is important to note that even within special use districts, there are many opportunities to mix in useful amenities and strong reasons to ensure that all the streets are walkable, bikeable, and served by transit. In industrial, office-dominated, educational, or medical campus districts, this enables restaurants, copy centers, and other support businesses to do well while reducing workers’ need to drive out of the district for basic services. These local-serving commercial uses can thrive if the environment supports their patronage, and housing can be integrated as well. Some key principles for the design of such districts include the following:



*Outdoor seating livens the street:
Culver City, CA (Credit: Sky Yim)*

- Districts can foster a critical mass of related businesses that function well in close proximity to each other (like industrial suppliers and manufacturers, or medical offices and a hospital).

- It is important that special use districts be organized around a balanced street network, with development standards to ensure that the urban design does not exclude pedestrians and bicyclists. Many employees and visitors arrive to their jobs by transit or bicycle, so accommodating pedestrians should be as important as moving goods and vehicles between businesses. Many employees who drive or take transit to work walk or bike to local destinations during their lunch breaks.



University of Oklahoma Campus (Credit: David Riesland)

- Where other uses (e.g., restaurants, cafes, and small convenience stores) are interspersed within the dominant land use, they should provide a pedestrian-friendly street frontage to encourage employees or visitors to arrive from nearby businesses on foot.
- Major corridors entering special use districts typically carry heavier traffic and trucks, but also need to safely accommodate bicycles and pedestrians.
- The street network should assure that truck freight traffic has clear paths of travel that do not encroach on sidewalks.
- Buildings in special use districts should provide a good public face along the streets, with noxious or unattractive uses behind buildings or attractive fences and landscaping.
- For special use districts like medical centers, the building frontage and entrances onto the campus and its individual buildings from the sidewalk should be pedestrian friendly and accommodate the mobility impaired. Services open to the public, such as cafés and gift shops, should face the street.
- Campuses, which are generally composed of larger areas without public streets, should have a clear network of pedestrian paths and streets that encourage walking and biking, not driving, and allow neighboring pedestrians and bicyclists to cut through the campus.
- Setbacks in special use districts will vary based on the street and sidewalk character the buildings front; landscaping should be provided along public sidewalks and shade trees should be provided to reduce the effects of urban heat islands, which are common in highly paved industrial districts.
- Parking in special use districts could include on-street parking to buffer pedestrians from faster moving traffic, and where provided onsite should be connected to clear, safe pedestrian pathways.
- Loading docks and service functions should be designed to not conflict with pedestrian entrances from sidewalks into the facility.

URBAN DESIGN

Urban design is the design of urban environments, whether in small villages, neighborhoods, town centers, or major urban districts. While sometimes used to describe just the selection of sidewalk patterns, benches, and streetlights, the term “urban design” is used here in its broadest and simplest sense: the design of environments in which people live, work, shop, and play.

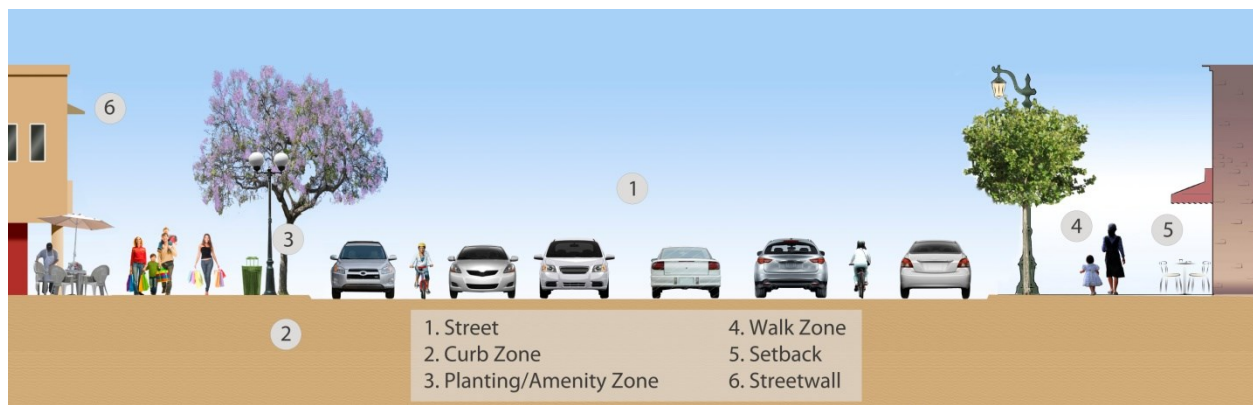


Urban design considers the relationship of site and building to the street, creates spaces for people, and can define the overall streetscape character: West Hollywood, CA (Credit: Lisa Padilla)

“Land use” is commonly used as a rough synonym for urban design, and often as a substitute for words such as “building,” “business,” “parking lot,” or anything else that is located on a parcel of private property. In this manual, the term is used to refer to the “use” of the “land” in question. Urban design encompasses site design and street design along with the allowed uses within a certain block or district of a city, and defines the nature of people’s experience of that place. The design and use of private development—collectively the “private realm” of the city—work

in tandem with and shape the public realm of the city, defining the overall character of the place. When the design of the private and public realm work well together, the places they make are often experienced as “great streets” or “great places,” and desirable destinations.

Once the desired character of the urban environment and the range of allowed land uses is determined, zoning regulations and development standards are prepared to support the desired type of place and street, so that the buildings that are developed (or are redeveloped) on each parcel play the appropriate supporting role in “completing the street.”



*The "public room of the street" is an important public space primarily shaped by the land uses and buildings that enclose it.
(Credit: Cityworks Design and Michele Weisbart)*

Creating great streets with good private realm design starts at the initial phase of laying out a project on a site, including the location and design of the building(s) and the design of the access, parking, and landscape. The following principles are general and are written based on practices that support livable and healthy communities through (i) thoughtful site design, (ii) appropriate building forms, and (iii) good relationships between the building and the sidewalk and street that it fronts.

THOUGHTFUL SITE DESIGN

The orientation of every building affects that building's relationship to people on the street. Each component of building demands careful site design. The following provide site design guidance:

- New projects or buildings developed on large parcels should form new blocks and streets that create a comfortable and walkable block size to help complete the network of streets (see Chapter 2, "Street Networks and Classifications").
- Buildings should be sited to support good connectivity to the center or neighborhood destinations that are nearby.
- Buildings should be oriented to the street to promote sidewalk activity and provide eyes on the street for the safety and comfort of pedestrians.
- The design of the site should minimize disruptions of pedestrian ways, whether sidewalks or mid-block passageways (typically by limiting the number and width of driveways).
- All buildings should be sited with their primary entries and fronts along the sidewalk, to encourage access from the sidewalk and on-street parking on foot.
- The number of driveways should be limited and consolidated. They should be no wider than necessary and designed to allow motorists to see pedestrians on the sidewalk.
- Parking lots and service entrances should be located toward the rear of the lot, accommodating automobiles but making it comfortable for people to access the buildings on foot.

- Wherever buildings are not built immediately adjacent to the public sidewalk, a coherent network of pedestrian routes should extend into the property so that pedestrians approaching from the street can access each building without walking through vehicular drives and parking lots.
- In all cases, the building pattern within a block should be designed to form comfortable, habitable outdoor spaces that promote a “sense of place” and a unique local character. Each building belongs to an individual or a business—the “community” is what happens between the buildings.
- The impacts of building form and site design on the larger neighborhood or district environment should be taken into consideration. For example, storm water can be managed on private property to reduce demands on the street infrastructure (collection and percolation), poorly functioning irrigation systems can be corrected (to minimize water waste and unnecessary run-off to the street), and building forms can be designed to provide access to fresh air and sunlight to their occupants and passersby on the sidewalk.

BUILDINGS' RELATIONSHIP TO SIDEWALK

Each building directly interacts with the adjacent sidewalk on a micro level. The following provide guidance for designing buildings with sidewalks in mind:

- Buildings contribute to the overall character of the street by providing well-designed frontages and clear entry points from the sidewalk.
- For active mixed-use and commercial streets, building frontages should be mostly transparent with “active storefronts” that allow pedestrians to see into shops, restaurants, and public spaces.
- Along residential streets, building frontages should include windows overlooking the street with a layering of landscape, porch, patio, or semi-public space that buffers appropriately (setbacks will vary based on street typology and scale of the buildings).
- The primary building face should be located on the most active street frontage with an attractive and welcoming facade that includes entry doors, windows, signs, and other character-defining elements.
- The secondary building face that exists along a mid-block passage or side street should also include openings overlooking the public space.
- The tertiary (back) side of the building is located along a back alley or service drive where pedestrian movement is secondary to service, with loading docks, service entries, trash storage, and other unattractive functions accommodated here.
- Blank walls should be limited to the rear, and very limited along the secondary face.
- Lighting should be integrated into the building design to indirectly illuminate the sidewalk at night by (i) light filtering through storefront windows, and (ii) architectural lighting that features the building itself and enriches the street environment at night.

APPROPRIATE BUILDING FORMS

Every building interacts with the street, so the details of key aspects of its form need careful consideration. The following provide building form design guidance:

Walkable Streets



Everything from the block size to the design of buildings and open spaces contributes to making walkable streets. (Credit: Cityworks Design)

- Building height, density, and setbacks are planned and designed to create a specific type of place that has a certain scale and character closely coordinated with the street typology.
- Building design standards should be developed to support a healthy street environment for pedestrians: for example, designing buildings to take into account how they interact with strong winds to create wind tunnels or unnecessarily restrict flows of natural light and air.
- On active mixed-use and commercial streets the design of the lower 3 to 4 floors should have an appropriate level of transparency and detail to support a great sidewalk environment for pedestrians.
- Buildings of 1 to 3 stories should be designed entirely at a pedestrian-oriented neighborhood scale, with features that can be appreciated by people walking or bicycling.

- Mid-height buildings of 4 to 6 stories should be designed at a pedestrian-oriented scale at the lower 2 to 3 floors and integrate windows, balconies, and other features that provide opportunities for occupants to overlook the street from upper floors.
- Taller buildings (over 6 stories) should generally have a base of lower floors designed similarly to those of mid-height buildings, and may benefit by stepping back from the frontage above this level to provide a street character that is not overwhelming to the pedestrian.
- In most mixed-use districts and neighborhood centers, it is more important to provide a relatively steady “street wall” to define a simple “street as an outdoor room” than to provide varied setback and stepbacks to “break up the mass” (see preceding section on streetscape environment types). In suburban environments where buildings stand free in the landscape, the desire to articulate the building form is understandable. However, in urban districts and centers the primary placemaking role of buildings is to calmly define the space of the place rather than to “express themselves” as unique objects.
- Towers in very dense districts (like an urban center) should be slender and mostly transparent, with a low to mid-rise base that provides pedestrian-oriented features. Towers should be designed to appear attractive and approachable from the street and sidewalk, not just to be an icon in the skyline.
- Parking should be integrated into the site and building design; ideally parking would be (i) underground, or (ii) tucked behind the building fronting the sidewalk and accessible from an alley or side street, or (iii) sited internally to the project or block so buildings “wrap it” to the greatest degree possible.
- Buildings should be designed applying universal access principles (like locating stairs in prominent locations to encourage people to use them) making naturally legible paths through good design and an integrated site and building design approach.



Active ground floor uses (Credit: Ryan Snyder)

POTENTIAL IMPLEMENTATION STRATEGIES

Tools available to help implement good urban and architectural design that support the creation of good streets and great places include the following:

- Community-based vision plans, which are critical agreements or road maps that articulate how communities see their streets, neighborhoods, districts, and future growth
- Zoning standards that allow, encourage, and require a diverse mix of land uses that support the creation of sustainable, valuable places
- Standards and guidelines associated with this type of zoning that shape and coordinate development with street design to ultimately deliver residents and stakeholders a fully realized vision that is authentic and unique to their community, and that supports a healthy, pedestrian-centered lifestyle

HEALTH AND LAND USE

Good land use planning and urban design can help create healthy neighborhoods with great streets and innovative and sustainable buildings. Some planning principles that should be considered include the following:

- Create a variety of places where people choose to walk and feel safe doing so—walking is an important form of daily exercise than can easily be integrated into the design of communities
- Provide opportunities and incentives to create social environments in which all generations mix. These could include public or private facilities that accommodate both youth and senior activities, or planning development where adjacent uses allow different generations of the community to interact on a regular basis. By contrast, environments in which one must drive from one daily activity to the next systematically exclude the very young and the very old, who cannot drive and become “involuntary pedestrians” in environments designed for cars.
- Assure access to healthy foods and grocery stores; limit fast food establishments and allow drive-through service only in places where it is in the community’s best interests to have passersby shopping without turning off their engines
- Capture opportunities for farmers’ markets – ideally on streets or within public spaces that are central and part of the local neighborhood street network
- Look for underutilized public space to provide community gardens within neighborhoods, which will encourage gardening and social interaction and provide access to fresh produce
- Integrate exercise routes and equipment into the network of streets, or even within underutilized roadway space (for instance, expanding neighborhood parkways where parking can be sacrificed, or a striped section of roadway that isn’t being used by cars but could be adopted for use by people)



Outdoor sidewalk social environment with activities for all ages: Venice, CA (Credit: Dan Burden)

- Promote sustainable planning practices and building design that help to preserve the environment through energy efficient design. Allowing residents and visitors to access the buildings without driving is the foundation of energy efficient design.
- Ensure complete bicycle networks and provide amenities within new projects to promote bicycling as appropriate to the scale of the project (bike racks, bike lockers, showers, or even a bicycle station)

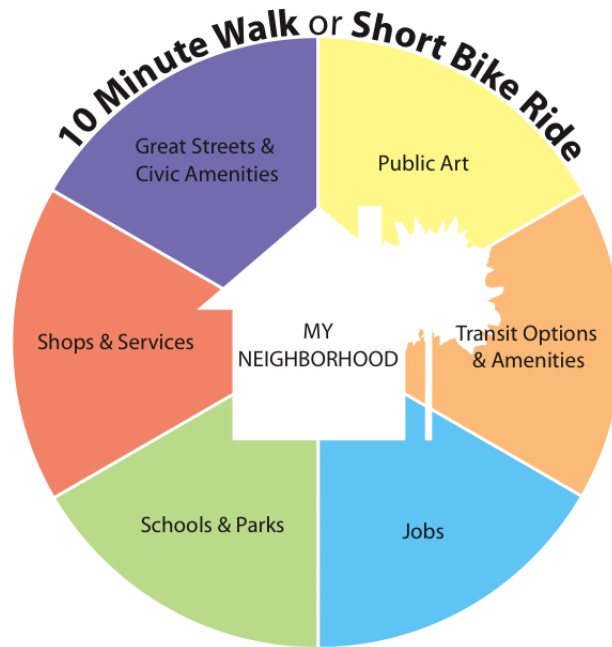


*New development should be planned to promote sustainable design and integrate gardens and open spaces that can be enjoyed by residents, or by pedestrians walking by.
(Credit: Bridge Housing, David Baker Architects)*

BENCHMARKS

Good land use planning and urban and architectural design are best measured by how they complete the community's vision for the specific place, and how they enhance the daily lives of their residents and users. Other qualitative and quantitative metrics that could be used to evaluate their effectiveness include the following:

- Jobs within a 15-minute commute by public transportation, bicycle, or walking
- Convenience shopping within comfortable walking or biking distance
- A school or park that a child can walk to/from home
- Useful transit within a 10-minute walk from home and/or work
- Clear zoning standards or design guidelines that help assure planning and design will be implemented as envisioned by the community
- Increased land values coming from the effective melding of transit, land use, and design
- The creation of great streets or places that people want to spend time in or live near



*Proximity of amenities in walkable neighborhood
(Credit: Cityworks Design)*

13. RETROFITTING SUBURBIA

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INTRODUCTION

Much of suburbia will have to change in order to thrive and meet the health, environmental, and economic challenges of the coming decades. Because of their form, widely separated land uses, and disconnected street networks, most suburban areas lack walkability and require that people travel by car for most of their needs. This has serious environmental consequences (poor air quality, climate change, and high energy consumption) as well as health consequences as suburbanites live in environments that discourage active transportation and favor driving. Residents in these neighborhoods tend to become isolated due to the lack of walkable streets and walkable destinations. Increasing fuel costs pinch both family budgets and local economies as people have less discretionary income.



Suburban development (Credit: Ryan Snyder)



Suburban street (Credit: Ryan Snyder)

Changing demographics also present challenges. Suburban homes have been built to accommodate young families with children, but fewer households now fit that profile. More and more households are comprised of empty nesters, young singles, divorced adults, and other non-nuclear families, and this trend is expected to grow in the future.

As fuel prices rise and as residents age, suburbs will need to serve more of their residents' needs closer to home, and serve those needs in places that can be reached

other than by driving. Suburban areas will need to be retrofitted to accommodate a new reality that rewards places that are close to more people and reachable in many ways.

This chapter describes how streets can support retrofitting suburbia, provides strategies for retrofitting streets, and recommends priorities and phasing. All of the changes recommended in this chapter will improve safety. The first priority for a city beginning to retrofit itself for the future should be to find and fix the places that are unsafe.

TRANSFORMING SUBURBAN STREETS TO LIVING STREETS

Streets play an enormous role in determining a place's quality of life. Everywhere in the country, people prefer a certain kind of street ("Redefining Charlotte's Streets," Urban Street Design Guidelines, Charlotte, North Carolina, 10/22/2007). People's favorite streets include those with:

- An abundant tree canopy and other streetscape features
- Sidewalks and buffering from traffic
- Moderate traffic speeds
- All kinds of uses (walking, cycling, driving, and enjoying the lawns or sidewalks and patios on either side)

People need not know the term "living street" to recognize and enjoy one.

The least favorite streets are those where driveways, parking lots, and utility poles are more abundant than trees and people. They often consist of wide expanses of pavement for moving traffic, and make little or no provision for any other users. In particular, there is little opportunity to cross the street.

The challenge for cities with too many least favorite streets is to transform them into most favorite, living streets.

CHANGING STREETS WITHOUT CHANGING THE RIGHT-OF-WAY

By definition, a retrofit occurs on an existing street. This manual gives design guidance for all streets, existing and new. The following section recommends how to accommodate those design recommendations on *existing* streets. Many aspects of living streets actually take *less* space than typical suburban design.

To create a living street in the right-of-way of an existing street, cities should do the following (LaPlante, J., "Retrofitting Urban Arterials Into Complete Streets," 3rd Urban Street Symposium, June 24-27, 2007, Seattle, WA):

- Consider opportunities to narrow travel lanes.
- Seek opportunities to put streets on a road diet; this involves eliminating superfluous travel lanes. Common scenarios include:
 - Consider conversion of candidate four-lane undivided roads to a center turn lane, two travel lanes, and two bike lanes. If the traffic volumes allow this sort of change, the result can be improved safety and access to adjacent destinations; the center



*Curb extensions with outdoor seating
(Credit: David Riesland)*

turn lane can be replaced with short sections of medians and pedestrian crossing islands in selected locations. On-street parking can be substituted for bike lanes where the context and conditions warrant it.

- Consider reduction of seven-lane roads to five lanes if conditions suggest such a change is appropriate
- Remove a travel lane from three- and four-lane one-way streets
- Make sure that corner curb radii are designed for the appropriate design vehicle. Occasional encroachment by larger vehicles into other travel lanes is acceptable; intersections should not be designed for the largest occasional vehicle.
- Eliminate unnecessary turn lanes at intersections, such as right-turn lanes with very few right turning vehicles. Free-flow right-turn lanes, including freeway entry and exit ramp connections to surface streets, should be replaced with YIELD control.
- Replace painted channelization islands at intersections with raised islands, to give pedestrians a true refuge, and to break up a long crossing of many lanes into smaller discrete steps.

All of these changes can free up space, which can be used for additional elements. To improve street quality, cities can:

- Paint bike lanes
- Add sidewalks
- Add raised medians, which visually narrow the roadway and provide a median refuge for midblock crossings
- Provide median and parkway landscaping, which further visually narrows the roadway and provides a calming effect
- Add or retain curb parking, which improves community access, calms traffic, and buffers pedestrians
- Add bulb-outs, which shorten pedestrian crossing distances and improve sight lines

NON-PHYSICAL CHANGES

In addition to physical retrofits, cities can and should adapt existing street management and operations to:

- Adjust signal timing for slower speeds and to ensure comfortable crossing times for appropriate populations. In areas with aging populations, for example, crossing times may need to be lengthened.
- Work with transit agencies to improve bus operations
- Work with schools to develop a Safe Routes to School Program
- Reexamine the parking code (for example, off-street parking requirements may be reduced, especially in coordination with additional on-street parking)

STREET CROSSINGS

A connected sidewalk network includes street crossings. See Chapter 4, “Intersection Design,” and Chapter 6, “Pedestrian Crossings,” for design details. To improve street crossings, jurisdictions can consider the following:

- Make pedestrian crossing locations safe, comfortable, and more frequent (LaPlante, J., “Retrofitting Urban Arterials Into Complete Streets,” 3rd Urban Street Symposium, June 24-27, 2007 Seattle, Washington.)
- Allow crossing at every corner of all intersections
- On streets with a bus route, make provisions for pedestrians to cross the street at all bus stops. Bus riders need to cross the street either coming or going. Provide midblock crossings. Pedestrians should not be expected to travel to the closest intersection to cross the street. Signalized intersections in suburban areas are often spaced $\frac{1}{4}$ mile, $\frac{1}{2}$ mile, or even further apart; it is unreasonable to expect people to walk that far to cross the street. Nor do signalized intersections offer safety benefits to pedestrians, due to the many added turning conflicts at large suburban intersections.

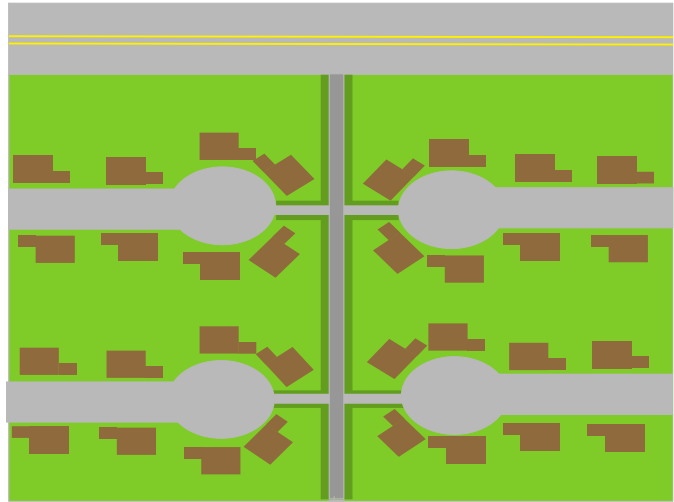


Midblock crosswalk (Credit: David Riesland)

Many of these changes can be made through spot improvement programs. Many are relatively inexpensive; it is not necessary to wait for a reconstruction to create a living street. More substantial retrofits may require reconstruction (see the Model Project section at the end of this chapter). A planned surface repaving project is an excellent time to retrofit the corridor to add comfort, convenience, safety, aesthetics, and economic value.

RE-ESTABLISHING STREET NETWORKS

Chapter 2, “Street Networks and Classifications,” details the need for interconnected street networks with short blocks. Much of today’s suburban landscape was built in isolated pods: residential subdivisions, business parks, shopping centers, and schools that are poorly connected to neighboring properties. These pods create barriers to getting around other than in a car, because they create long distances between destinations and because the pods are often surrounded by sound walls, fences or berms, literally blocking potential bicycle and walking routes. These pods don’t *work* well for auto traffic either, since they force all traffic onto busy streets rather than allowing connection and local circulation through local streets.



Connecting cul-de-sacs (Credit: Marty Bruinsma)

To create a vibrant suburb that will thrive in new conditions, direct connections must be created or re-created to enable efficient, direct travel by everyone. That means establishing or re-establishing street and sidewalk networks.

Re/establishing a street network can be more challenging, particularly when right-of-way has not been preserved. Some cities have purchased homes at the end of cul-de-sacs, put the connectors in, and then sold the homes. In cases where a city is still developing suburbs, it should make connectivity a fundamental priority by following the principles in Chapter 2, “Street Networks and Classifications.”



Cul-de-sacs break up connections.
(Credit: PB Americas, EWA Connection Study, May 2009)



Pedestrian networks can be re-established by opening noise walls and connecting new sidewalks. (Credit: PB Americas, EWA Connection Study, May 2009)

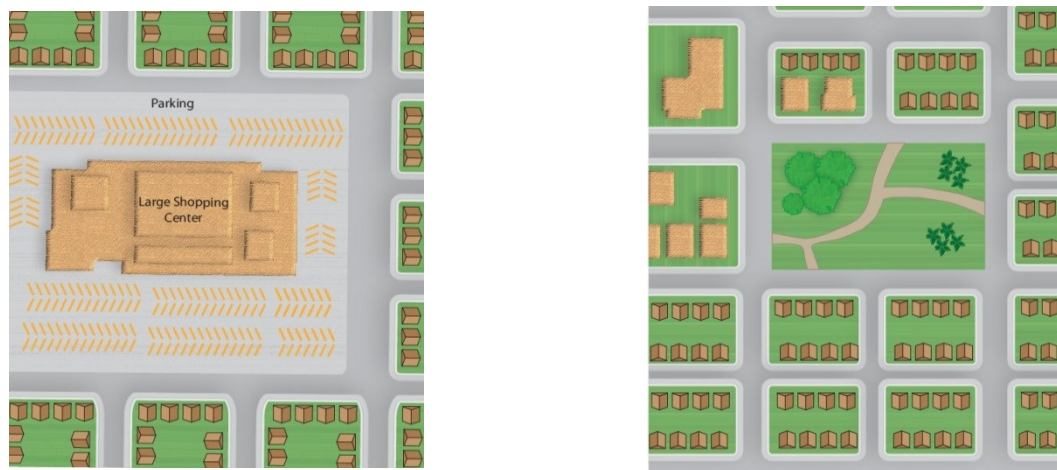
SECOND-GENERATION LAND USE ALONG TRANSFORMED STREETS

Not only streets will need to change in suburbia; many land uses are obsolete and/or no longer economically viable. However, street improvements generally come before land use change in suburban retrofitting. This is because *high-quality land uses come to high-quality streets*. Very rarely will high-quality land uses come to low-quality streets.

The street and the land use work together and determine whether a place is attractive and draws people and investment. To that end, communities retrofitting older suburban areas would do well to use the following three principles:

1. Focus new investment in nodes on streets.

In most of suburbia, there will not be enough investment all at once to transform whole



*Conversion of shopping center to a neighborhood
(Credit: Michele Weisbart)*

corridors. Identify and focus investment at individual nodes.

2. Focus revitalization efforts on creating genuine places in those nodes: compact, mixed-use, and at least internally walkable.

Plan for and enable neighborhood-serving commercial districts. Where necessary, rezone from automobile-oriented commercial sites (gas stations, convenience stores, and fast food outlets). These car plazas are designed for, and dependent on, vehicular access and offer no relationships with the nearby residential areas. They absorb retail potential and will tend to discourage development of neighborhood-serving commercial districts.

3. Carefully detail the desired outcomes.

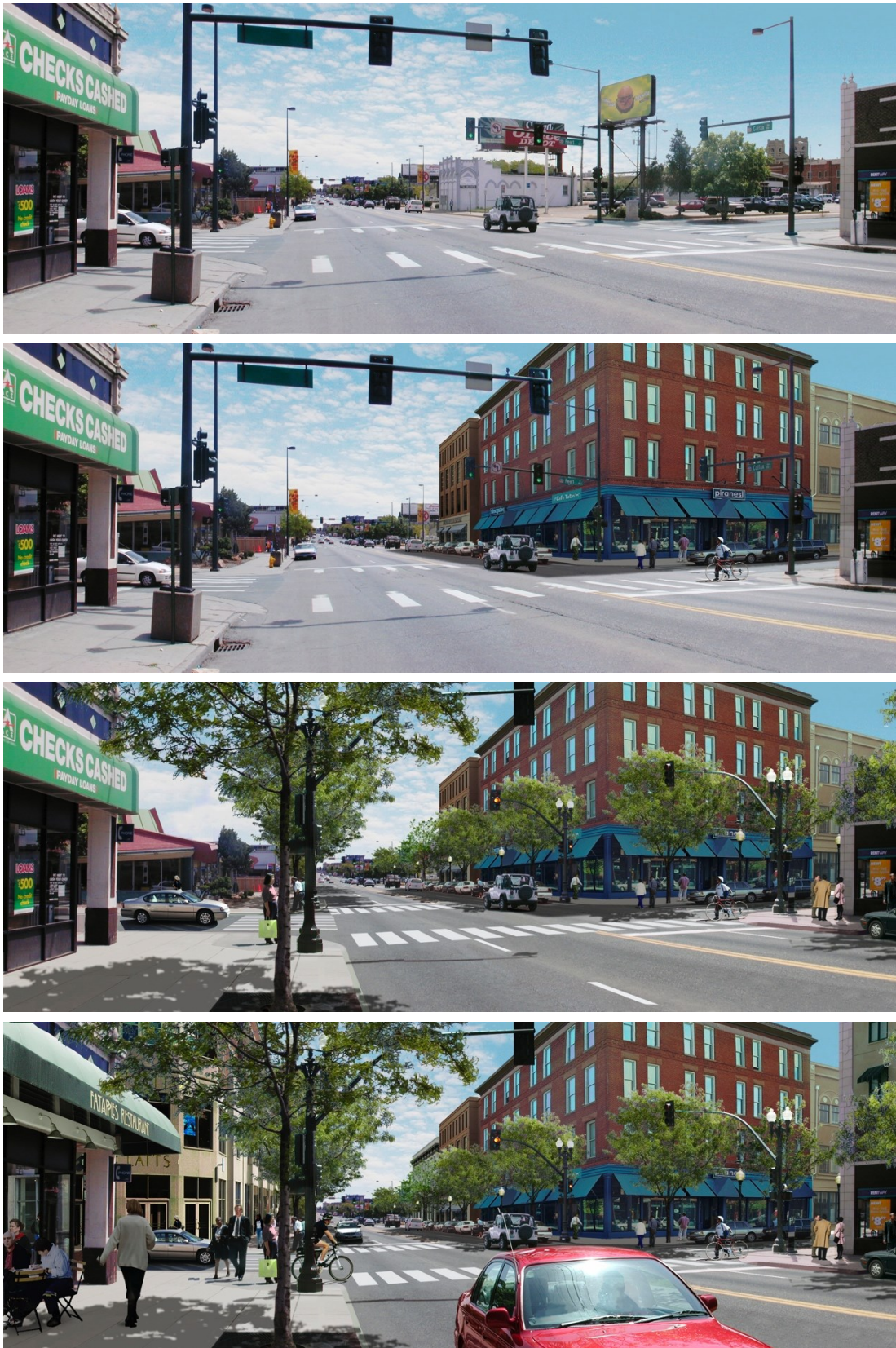
Retrofit efforts should pay attention to the details described in the various chapters of this manual. Adopting well-intentioned policy goals is not enough. Follow through is needed by incorporating the vision's details in design and construction of the project.

Infill development between nodes that follows the principles of this manual will help to connect the nodes into livable neighborhoods.

SETTING PRIORITIES AND PHASING

The primary challenge in retrofitting suburbia is less about fixing the infrastructure and more about creating economically sustainable places—with the emphasis on place.

As suggested above, the priority should be to begin by creating vibrant nodes. Cities should not allow themselves to be daunted by the scale of the retrofit challenge. As with street retrofits, creating places can be done incrementally. The images on the next page show such an incremental process.



Example of a transformed suburban street (Credit: Urban Advantage, Inc.)

MODEL PROJECT: BRIDGEPORT WAY

Before, Bridgeport Way in University Place, Washington, was a classic auto-oriented suburban arterial street. The existing street had a high accident rate, and did not support economic growth; it attracted neither people nor investment.



Bridgeport Way before transformation: University Place, WA (Credit: Dan Burden)

After reconstruction, the corridor served more people, was far safer, and drew economic development.



*Bridgeport Way after transformation: University Place, WA
(Credit: Michael Wallwork)*

Safety improved significantly:

- 7% speed reduction (35.3 -> 33.4 mph)
- 60% crash reduction (19 -> 8 in five blocks)

Bridgeport Way illustrates the principle described above of leading with a street retrofit, then following with bringing higher-quality land uses to the now high-quality street.

The City of University Place identified empty, redevelopable space along the corridor and at intersections. The photo below shows ample space that has been used for parking, building setbacks, and other uses.



*Bridgeport Way transformation opportunities: University Place, WA
(Credit: Michael Wallwork)*

The City planned for new development that would create a new *place*, as shown in the rendering below.



Bridgeport Way plan: University Place, WA (Credit: City of University Place)

ADDITIONAL RESOURCES

ICF International with Nelson\Nygaard Consulting Associates and Reid Ewing. *Transportation Study of the U.S. Route 1 College Park Corridor*, July 14, 2008.

PB Americas, EWA Connectivity Study, May 2009.

Dunham-Jones, E. and Williamson, J., *Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs*, John Wiley & Sons, 2009. This book focuses more on retrofitting parcels of land, rather than on the streets between them. Nonetheless, it is an excellent resource.

14. COMMUNITY ENGAGEMENT FOR STREET DESIGN

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INTRODUCTION

Effective community engagement is critical when developing policies and projects that make a community's built form more livable and more supportive of active transportation. There are many benefits of effective community engagement in projects influencing the built environment, be they urban, suburban, or redevelopment projects.

Effective community engagement improves the success rates of policies and projects affecting the built environment because it helps the agencies and organizations leading a project understand and respond to local conditions. Agencies that create true community engagement are more successful at adapting to socio-economic changes that may influence the effort than those that do not conduct effective outreach (Cogan, E. and Faust, S., *Innovative Civic Engagement Tools and Practices in Land Use Decision-Making*, April 2010). When people affected by a project are involved from the beginning of the planning process, the likelihood of unexpected or significant opposition when it comes time to implement the project is reduced. Community members also have unique knowledge of local contexts, including political, cultural, and geographic settings. By interacting with the public and gaining local insight, project leaders can shape and direct the project in keeping with the community's vision and needs.



*Public workshops should involve people in the planning process.
(Credit: Dan Burden)*

Effective community engagement also has the power to build social capital—the “social networks and interactions that inspire trust and reciprocity among citizens” (Leyden, K., “Social Capital and the Built Environment: The Importance of Walkable Neighborhoods,” *American Journal of Public Health*, 2003, 93[9]:1546–1551). A community with a high level of social capital is characterized by a culture of neighbors knowing each other, interest and participation in local politics, high rates of volunteerism, and diversity in social connections. These characteristics foster a sense of community, engender trust, enhance innovative problem solving, and increase the likelihood that stakeholders will support financial investments in community projects.

Research has demonstrated that a population can achieve long-term health improvements when people become involved in their community and work together to effect change (Hanson, P., “Citizen Involvement in Community Health Promotion: a Role Application of CDC’s PATCH Model,” *International Quarterly of Community Health Education*, 1988-89; 9[3]:177-186). Thus, even before projects are fully developed, creating a strong community engagement process sets the community on a path toward improved health. Effective community outreach also helps address unequal access to health, including issues such as active living. Health equity, or the fair distribution of health determinates, outcomes, and resources regardless of social standing, is affected by factors such as poverty, housing, language, quality of education, and quality of

healthcare. Through successful community outreach, people of all backgrounds and social standing are able to contribute to projects that support health and well-being. They also can help project leaders better understand how social, cultural, and economic barriers that impact historically disadvantaged communities are relevant to improving community health and well-being.

This chapter reviews principles and strategies to engage communities, including developing a plan for reaching out to communities, broadening the list of community stakeholders, fostering cultural competence, and achieving informed consent.

ESSENTIAL PRINCIPLES OF COMMUNITY ENGAGEMENT

Given the many benefits offered by true community engagement, it is clear that project leaders, policy-making bodies, government agencies, health agencies, and community organizations have a special obligation to develop an inclusive approach to outreach. To engage communities, leaders must move from the conventional model to one that focuses on outreach, capacity-building, inclusiveness, and collaboration. Employing the following principles and strategies will help.

DEVELOP A PLAN

Project leaders shouldn't begin a public process without first developing a thoughtful and thorough community outreach plan that describes the desired outcomes of the project, and details the public process, including who the stakeholders and audiences are, how they should be reached, the messages to garner interest and tools that will be most effective in reaching them, and how the success of the effort will be measured. The plan should describe how outreach efforts will help build capacity, promote a shared language, illustrate project benefits, and inspire participation.

In general, community engagement activities need to address issues that the public perceives as important. Thus, while developing the community outreach plan, project developers should seek ways to explain to the public why the project matters. Additionally, efforts should be made to conduct workshops, events, or meetings in places that are comfortable and familiar to the audiences, and to use language that is clear. Each communication or event should contribute to the public's understanding of the project and its purpose.

This chapter does not provide a template for a community outreach plan; it provides general guidance to help project leaders understand important principles and methods of achieving community engagement. With this guidance, a community outreach plan can be developed that utilizes best practices to accommodate local contexts and support community needs in working toward the goal of the project.

A community outreach plan should at the very least describe the project, the goals of the outreach effort (definition of success), identified issues, target audiences, messages that are meaningful and relevant to the audiences, distribution channels, key messengers or speakers,

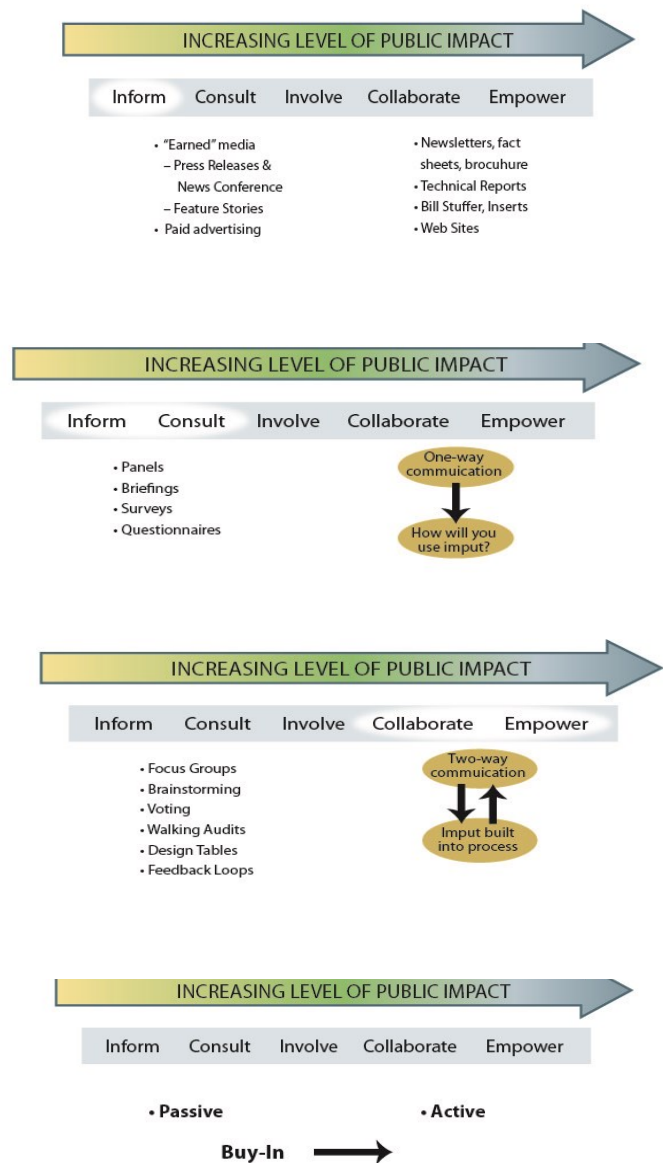
resources available, tools, timelines, desired outcomes, and methods of evaluation and adjustment.

Specific outreach tools may include educational workshops, media outreach, paid advertising, surveys, print materials (such as flyers and brochures), PSAs, educational videos, slide presentations, charrettes, newsletters, websites and other online communications, social media, direct mail, letters to the editor or guest commentaries, councils, speakers' bureaus, partnerships, coffeehouse chats, meetings, interviews, demonstrations, bulletin boards, and more.

ACCEPT RESPONSIBILITY FOR SUCCESS

Project leaders must take responsibility for developing effective and successful outreach programs that achieve identified goals. A meaningful outreach message would be that community members' input is needed to shape the community's future; the announcement would speak of streets, sidewalks, trees, and parks, would explain that transportation systems are integral to community-building, and would request residents' help to determine what their community should become.

If truly effective community outreach was conducted and the public showed little interest in the process, then the value of the project to the public must be revisited. If, on the other hand, project leaders understand the project truly is important and the public simply hasn't engaged, then the effectiveness of the outreach effort must be revisited. Were the messages meaningful to the identified stakeholders? Were events held at convenient and comfortable times and places? Did people perceive the process as interesting, simple, important, or relevant to their lives? Did the messages even reach the target audiences?



Credit: Michele Weisbart, adapted from the International Association for Public Participation)

Appropriately defining success and failure of a public process is an important part of developing a community outreach plan.

When defining success and failure, consider whether the community engagement effort should be designed to:

- Inform: community members are informed about the project but aren't actively involved in the process.
- Consult: the public is asked to provide feedback on analyses, alternatives, and decisions.
- Involve: feedback loops allow community members to influence multiple stages or drafts of the project.
- Collaborate: the public is a partner in each phase of the decision-making process and provides direct advice on solutions.
- Empower: the final decision is in the hands of community members and the project leaders will implement what the community chooses. Care is taken to ensure that the community is educated about approaches that work for all people, that key participants will help spread the word throughout the community, and that community members will play an active role when issues come before policy or decision-making groups such as councils and commissions.

Outreach programs that most actively engage and empower the public also lead to the highest levels of buy-in and build the greatest support, which help alleviate some of the pressure on staff and elected leaders.

START WITH A BASE OF SHARED VALUES AND BUILD UNDERSTANDING

Start the public process with visioning sessions or educational workshops that identify or clarify shared values. In some communities, a vision plan already exists and in those cases, the vision plan should help guide the project development. In other communities, a simple values-clarification exercise during an initial public workshop can go a long way toward helping stakeholders see that they generally want the same things for their streets—safety and security, economic development, attractive sidewalks, landscaping, and so on—and that their goal should be to collaborate on ways to achieve those ideals through the project being developed. Values clarification also can provide useful guidance to policy makers when trade-offs are concerned, for example, when the potential long-term effects of a decision are measured against short-term gains or losses. Starting with a base of shared values helps ensure outcomes aren't predetermined, but that the local vision is driving the process.

From this base of shared values, strive to build understanding and knowledge. Think like an educator, use language that is familiar and clear to the audience, and encourage reciprocal learning (learning from each other) and experiential learning (learning by doing or experiencing). Frame issues neutrally to maintain credibility and to ensure participants can make informed

decisions. Facilitate well-informed and well-rounded discussions that ensure all voices are heard.

Toolbox: Active Workshops and Design Charrettes

Two tools being used by more and more communities throughout the country are active workshops and design charrettes.

Active, or experiential, workshops get participants out into the community to explore firsthand what shortcomings exist and how to improve upon those conditions. Active workshops include educational presentations, but focus on active learning and firsthand experience. Active workshops don't have to be long events. A successful one can be as short as three hours, if planned well.

Charrettes are collaborative sessions to solve design problems. Charrettes usually involve a group of designers working directly with participants to identify issues and create solutions. A charrette can be one day, several days, or weeks. A charrette conducted as part of a public process for a street should include educational activities (such as short presentations and walking audits, sharing of expectations and desired outcomes, priority setting, mapping exercises during which participants break out into small groups and mark-up maps with potential challenges and opportunities) and building consensus or informed consent for a proposed solution or set of solutions. Charrettes create a collaborative planning process that harnesses the talent of residents, town-makers, community leaders, and public health officials alike. At the end of the charrette, project leaders present the outcomes and findings to stakeholder groups and to the public.



*Design charrette engaging stakeholders
(Credit: Dan Burden)*

Getting all the right people together for a design charrette is essential to make sure that the outcome reflects the values and goals of the community. People from all sectors of society with diverse backgrounds are needed at a charrette, including local government officials, planners and designers, landscape architects, transportation engineers, nonprofit managers, public health officials, and of course, residents.

Even with engaged and motivated participants from all relevant backgrounds, the charrette still may be missing a group that can provide valuable insight about how to design a healthier and happier community: children. Children's charrettes can bring valuable stakeholders in that might not otherwise be able to participate. They also provide the benefit of a unique perspective. The chief objectives in a children's charrette are for it to be fun and engaging. Work with schools, parks and recreation departments, and parent/teacher associations to identify the best venue for engaging children and to conduct the needed outreach to ensure children attend. Also, make sure children's charrettes are age appropriate.

Effective active workshops and design charrettes help build social capital in the community. When people are taken outside of a classroom or presentation structure and are put in an environment, such as designing around tables or walking along streets to evaluate the built environment, where they can converse freely and naturally with others, many shared interests and connections emerge. This can foster partnerships that cross real or perceived boundaries, such as differences in generation, culture, socio-economic status, or geography. Effective workshops and charrettes often dedicate time toward the beginning of the events to help participants get to know each other through ice-breaking exercises that ideally will lead to long-lasting relationships.

Planning and conducting successful active workshops and design charrettes requires attention to the following details:

- **Engage key partners early.** Identify community-based organizations, government agencies, healthcare providers, employers, school boards, the media, and other organizations whose members or stakeholders may have an interest in the topic. Engage transportation, planning, emergency services, public health, and public works entities early in the planning process, and then enlist their help to conduct outreach and to issue invitations.
- **Choose the right audit site.** Work with the key partners to identify an audit site that captures the essence of changes needed throughout the community, or one that will have the greatest impact or has the potential to become a model project and serve as a catalyst for other projects.
- **Consider comfort and abilities.** Give careful consideration to participants' comfort and abilities. Everyone who wishes to take part should be able to do so, and any special needs should be accommodated. Also, if the event is held during hot or cold months, conduct outdoor portions during the most comfortable time of day. Accommodate the needs of participants: for example, providing food allows working people to attend a 7 p.m. workshop; parents may need an organized play room for children too young to participate in the workshops.
- **Encourage relationship-building and provide a next step.** Effective workshops and charrettes will motivate and inspire those who take part, and many will be eager to contribute their energies toward enacting change. They will need to draw upon each other's strengths, stay in contact, offer each other support, and share information to undertake the important work to be done. Encourage them throughout the event to network with each other and exchange contact information. If possible, form a "working group" and decide upon a first meeting date; invite people to opt in.

In particularly successful workshops and charrettes, project leaders can stand back and observe while residents pore over maps, draw meaningful new lines, find ways to improve access to healthy eating and active living, and generally work together toward a shared vision. Project



leaders will need to provide technical guidance, but the community can and should make choices about the future together.

BROADEN THE LIST OF STAKEHOLDERS

To build effective community engagement, project leaders should broaden the list of stakeholders and partners whose involvement is sought. The overarching goal should be to achieve diversity by involving a demographically and geographically balanced group of people representing various interests and backgrounds.

Stakeholders and partners commonly include city and county staff, advocacy groups, residents, business operators, property owners, elected officials, community leaders, neighborhood safety groups, emergency responders, school representatives, health agencies, “Main Street” or downtown groups, charitable non-profit organizations, and regional employers. To be more effective, project leaders also should seek the early involvement of faith-based organizations, news outlets, potential opposition groups, and seasonal residents.



*Involve all types of stakeholders
(Credit: Dan Burden)*

In every community, there are people and groups that serve unique roles or have connections built on local context or events. Project leaders should determine who they are and invite them into the process early.

Faith-Based Organizations

Across the country, churches, “build and sustain more social capital—and social capital of more varied forms—that any other type of institution” (*Better Together, The Report of the Saguaro Seminar: Civic Engagement in America*, Harvard University’s Kennedy School of Government, 2011). In small towns or areas of sprawl, churches, temples, and mosques often serve a major role in building community and capacity for change. Thus, project leaders should seek innovative ways to work with church leaders to engage their membership in public projects.

Potential Opposition Groups

Special efforts should be made to identify and reach out to people and organizations that may be expected to oppose the project, to build their trust and involvement. Try to identify and address their concerns both as part of the public process and during special stakeholder interviews or meetings. This may include internal groups or professionals who initially may be inclined to provide technical brush-offs. For example, they may at the outset be worried that sanitation trucks won’t be able to maneuver on narrow roads, that trees may disrupt drainage, or that a crosswalk isn’t needed where people don’t already try to cross the road.

Whether internal or external, these concerns should be addressed early in the public process to give the potential opposition time to understand the project, become comfortable with proposed solutions, ask many questions, and decide whether to support the effort. Support is much more likely when these individuals and groups have been invited into the process early and have been included as key stakeholders. If participants feel as though the outcome is their plan, they are less likely to oppose it. By working side-by-side with other stakeholders, they learn to appreciate and accommodate others' points of view.

Moreover, opposing groups often bring legitimate concerns to the design process. Through their involvement they can improve projects.

Children

Children have much to offer in the community planning and design process, yet they remain mostly untapped throughout community transformation processes. A child's imagination is a powerful tool; children can dream the perfect community in which to live, play, and go to school. Beyond the power of their imaginations, they can also bring very practical solutions to the table. For example, children are often aware of shortcuts that could be formalized into trails and added to the community's pedestrian network map. Their values and honesty helps raise the discussion to the level of guiding principles; the involvement of children in public processes can change the whole tenor of the event. Engage children through children's charrettes, art or urban design contests, school field trips, and special activities at community charrettes or workshops. Invite them on walking audits near their schools. At the very least, provide schools with flyers announcing the project or public process that can be sent home with children in their bags.



*Children at workshop
(Credit: Dan Burden)*

Toolbox: Media Outreach

Conducting effective outreach to news outlets is important to the success of any community engagement effort. The news media are more than simply a means to get the word out about the project. Rather, project leaders should try to build capacity among news organizations, just as the outreach effort seeks to build capacity among community members; building relationships with reporters helps ensure the general public is receiving accurate, timely, and meaningful information about the project.

The lead agency's communications department should be consulted to provide guidance, expertise, and tools, but project leaders should remain very engaged in the media outreach effort.

Project leaders should be committed to working within the agency's communications protocols, such as complying with a gatekeeper policy if one exists. If a communications department isn't available, the following paragraphs provide general guidance.

Call Key Outlets Early

As soon as the project kickoff is confirmed or possibly even earlier, call—don't email, fax, or send a letter—key reporters to share the purpose of the project and to ask them how best to provide more information when it is available. Keep a list of the contacts made and how they would like to receive additional information; then, be sure to follow up in that manner.

Depending on the news organization and its depth and structure, special effort should be made to reach transportation, public safety, and health and business reporters. Contact the primary news sources in local and regional markets, but don't overlook non-traditional news sources, such as blogs that cater to cyclists or that address transportation, public safety, community health, retirement, and business issues. Any key reporters—regardless of their medium—should be contacted as soon as possible by phone.

Also, offer to submit a guest commentary in advance of the project kick-off or to secure a prominent guest for an upcoming talk show. If the project may be especially controversial, try to schedule an editorial board meeting with the local or regional paper.

Issue Meaningful Press Releases

Develop a press release that is engaging and written in the form of a news story. Be sure to include the five W's—who, what, why, when, and where. Describe the goal of the project, how people can become involved, and any other information that will help make the story meaningful and relevant to the local and regional audience. Include keywords to ensure the press release and its contents can be easily found online. Distribute the press release initially to the key media outlets already contacted, and be sure to provide it in the manner they requested (check the list made during the initial conversations). Then, distribute the press release to all other media outlets in the region. Also, consider including non-traditional news sources in the media outreach strategy.

Finally, distribute the press release to local partners and other local contacts, asking them to share it with their media contacts. The value of the relationships the local partners already have with media contacts shouldn't be overlooked; tap into that value by supporting the local partners in their efforts to conduct media outreach for the benefit of the workshop and related efforts

Be Responsive and Keep in Touch

As project leaders build relationships with news sources, they should expect to receive more and more inquiries. Understand that reporters often are working on very tight deadlines; sometimes they receive story assignments mid-day with evening deadlines. Be responsive and provide timely information to help ensure accurate details are relayed to news audiences and to further support the relationship with the reporter. Additionally, be proactive in sharing news about project developments or milestones being met; doing so will further build capacity amongst the news sources, help keep them engaged in the project, and support the dissemination of timely and accurate information.

Media as Stakeholders

Conventional community outreach plans have treated the media as a means of simply disseminating information. A more effective approach is to engage members of traditional and non-traditional news outlets alike (newspapers, television, radio, online news services, bloggers, etc.) as stakeholders and seek their involvement early in the process. Just as project leaders should build capacity amongst residents and within the community, so too should they seek to build capacity with journalists and news outlets. The media can also help projects move forward with positive editorials and favorable reporting.

FOSTER CULTURAL COMPETENCE

Ensuring that programs and messages are designed to be relevant, appropriate, and effective in different cultures and different languages is vital to conducting successful community outreach. In fact, cultural competence has emerged as a key strategy to improving health and the quality of healthcare and social services for everyone in the U.S. regardless of race, ethnicity, cultural background, or language proficiency.



*Stakeholders share the planning responsibility
(Credit: Ryan Snyder)*

Translating important messages requires strong cultural knowledge, because “simply replacing one word with another won't do” (Zarcadoolas, C. and Blanco, M., “Lost in Translation: Each Word Accurate, Yet...,” *Managed Care Magazine*, August 2000). However, reaching people of all backgrounds often requires more than simply translating messages. Even in urban communities, but especially in rural areas or small towns, messages perceived to have been created by “outsiders” can actually do more harm than good by creating discomfort or mistrust.

To increase their effectiveness, many organizations working with multi-cultural populations are developing “ambassador” programs that recruit people who live in and work in a community to be community educators and liaisons between the project or program and the community. Other communities are working to culturally adapt messages, instead of simply translating them, to focus on types of behavior changes that would be relevant and appropriate in the cultural context of the different audiences.

When culturally adapting messages, consider the following:

- Language doesn't equal culture. Although a shared language is important to culture, people who speak the same language often are from different cultures. Be sensitive to the differences and develop appropriate messages.
- Start with strong cultural knowledge. Tap the knowledge of in-house staff or consultants who live, work, or grew up in the culture.
- Get feedback. Work directly with members of the audience to determine appropriate approaches. Use focus groups to screen messages before they are distributed.

EXPECT EMOTIONAL CONNECTIONS—AND REACTIONS—TO THE BUILT ENVIRONMENT

People have strong emotional connections to their built environments, and those feelings influence involvement in community-building efforts. The structures and infrastructure around people create strong frames of reference for daily living and help build comfort, a sense of security, and a sense of belonging.

Place attachment is a notable part of daily life. Project leaders should anticipate that responses to projects may be emotional, but those responses shouldn't be dismissed as invalid; they should be addressed as valuable input.

APPROACH ENGAGEMENT AS A TWO-WAY CONVERSATION

Effective public engagement involves more than telling people about a project; effective engagement facilitates a dialogue that leads to reciprocal learning, collaboration, and ideally, consensus.

Community members have unique knowledge of local contexts that will affect the outcome of a project development process. By engaging in reciprocal learning, project leaders will gain insight and perspective that can help them ensure the project is tailored to meet the community's needs. Community members also will learn from each other.

An effective public process results in people feeling that they are well-informed and that they've had opportunities to contribute throughout the stages of decision-making.



Product of design charrette (Credit: Ryan Snyder)

“In fact, what appears to be most important from a citizen's perspective and from the standpoint of attaining ongoing engagement is not the strategy employed, but how government responds when citizens voice their preferences. For citizens, there are two questions that are paramount: Did the government listen and take action based on what they heard from us? Was it worth my

time and effort?” (*Connected Communities: Local Government as a Partner in Citizen Engagement and Community Building*, Alliance for Innovation, Oct. 2010).

In addition to workshops, project leaders can seek community input through interactive online tools such as websites, digital storytelling, and community mapping. In communities with many seasonal residents, these tools can be especially useful in collecting input from stakeholders who aren’t able to attend events in person.

Digital storytelling allows the public to use photos and presentation tools to illustrate concerns about the built environment. Many communities are starting to use this “photo voice” approach to encourage community members to present their points of view using photographs and descriptions or narration. The package can be submitted electronically to project leaders or presented as part of a public workshop or event.

ACHIEVING INFORMED CONSENT

The goal of informed consent is not compromise, where everyone must give up something. Informed consent is based on the assumption that most people will give their consent to a change, even when it is not in their personal best interest, after they have been engaged, become informed, and see the value to their community. Working cooperatively, all people achieve more, and so enlightened self-interest wins, once people understand why an idea is good for their neighborhood.

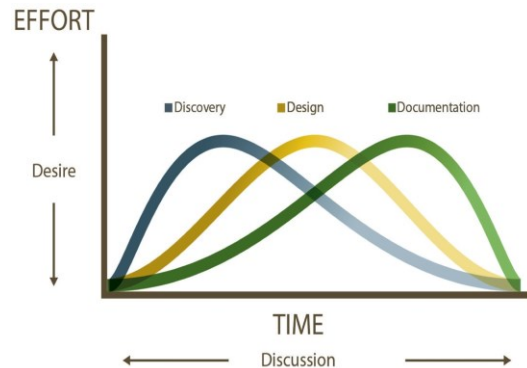


Stakeholders designing their streets
(Credit: Dan Burden)

The steps of the informed consent process are as follows:

- **Desire.** The public process comes about as a result of a community coalescing around a desire for a change in its built form. Though desire comes in different forms, it is the necessary energy and often passion used to steer the project towards a sustainable and community-oriented outcome.
- **Discovery.** Discovery is the process of developing a complete and common understanding of the situation, context, and the built vision by the design team and the stakeholders. Context is a short form for the physical, social, historical, fiscal, environmental, political, and climatic contexts. Good discovery is done by:

- Listening, looking, and involving people
- Visiting, reading, and probing
- Educating and exploring physically and intellectually
- **Design.** Design is the employment of people, their related skills, and what they discovered to produce products that articulate, memorialize, and motivate people towards the consensus outcomes and the vision. It tends to be the most exciting part of the process. This is when collaborators can raise the bar in terms of creativity and sustainability.
- **Discussion.** Discussion happens throughout and requires the right people/stakeholders with the capabilities present at the right times in order to maximize short feedback loops. It is the discussion phase that builds and overcomes uninformed decision making. If grassroots planning is to work, people must become informed on what helps build a community. With the combination of a strong desire and community leadership the sense of frustration will be overcome, but this must come with an informed neighborhood. Discussion involves:
 - A series of presentations to raise stakeholders' knowledge
 - Testing/viewing the design and parts of the design from a variety of perspectives
 - Circling back to alter parts that need altering
 - The project manager must prepare the community to "sell" its vision to others. True ownership of a vision comes from within.
- **Documentation.** Documentation starts at the beginning of the project but the effort is highest towards the end when the products are finalized. Example products include documents, posters, codes, speeches, agreements, construction drawings, and advice. This documentation works best when designers anticipate pushback. Messages must be clear, concise, comprehensive, and attractive to draw people into the process.



Steps of the informed consent process (Credit: Michele Weishart. adapted from Ian Lockwood)

CARRY THE MOMENTUM FORWARD

Successful community engagement often leads people to become motivated and ready to mobilize to enact positive change. Project leaders should capitalize on this energy and help form long-lasting coalitions by organizing a working group or advisory council that will help carry the momentum forward. The members of the group should represent diverse interests and backgrounds and should be committed to continuing to communicate with each other and meeting regularly to address the issues identified through the project development process. The group can be established to provide guidance and continuing community feedback to project leaders as implementation begins.

Celebrating early successes helps ensure long-term project success. When project implementation begins, identify an early achievement and widely publicize the success; this can even be the project's public process itself. Consider holding a special event that will publicize the new community asset, bring recognition to the people involved, reaffirm that the process has worked, and build more support for work to be done. For example, the completion of a trail or trail segment could be celebrated with a special family fun run/walk held in conjunction with a ribbon-cutting ceremony and press conference. Widely celebrating projects like these helps people in nearby communities envision how they can improve their neighborhoods as well.



Community celebrates and supports their achievements (Credit: Michael Ronkin)

Toolbox: Strategies for Implementation

The following strategies can be helpful in implementing projects:

- **Secure and leverage the support of key partners early.** They may be members of the chamber of commerce, influential elected leaders, chief planners of agencies, or community advocates. Leverage their support by ensuring other key partners are aware of their buy-in.
- **Use data appropriately.** Too many towns don't implement projects because they lack data, or conversely, they rely on it too heavily. Presented with too much, people may argue over its meaning, leading to projects not being built and community members losing trust in project leaders. Some data is needed to ensure the context is properly understood. Thus, conducting research to collect basic data is necessary, but street design projects also should be driven by commonly held values in the community.
- **Build model projects.** Model projects can be examples of how streets can work better, especially when building something that is new for the community, such as a non-conventional crossing, a road diet, reverse-in angled parking, mini-circles, or roundabouts. Build model projects first in areas with strong backers and the greatest chances for success. If the vision is to have modern roundabouts in a dozen locations, start with the location with the most enthusiasm and support. Enlist local leaders to attend meetings, submit letters to the editor, and conduct other outreach that explains why the neighborhood wants the new feature.
- **Evaluate built projects.** Don't just build a project: evaluate it. For example, a 30 percent increase in people walking, 20 percent more bicyclists, a reduction in vehicle speeds of 7 mph, 120 column inches of positive newspaper coverage, and other metrics can validate the project and build support for similar projects. Use other performance-based measures to evaluate success not only of the project, but also of the public process that led to it. Evaluations can assess the assumptions and the planning processes that lead

to changes. Assessment of the planning process includes evaluations of how well the project performed. Evaluation can include the following:

- Did the project meet the commonly-held community vision?
- Important projects that benefit all members of the community are the first to be built. Did those built reflect the community's priorities?
- Did the project provide long-term benefits to all people?
- Did the process allow for adequate time to respond to plans?
- Were there any legal actions or complaints about the public process that could have been reduced or eliminated?
- How can the public process improve?

CONCLUSION

Creating successful community engagement through effective outreach is a significant investment of resources, but many of those resources already exist in-house and simply need to be committed to the effort. For policy-making bodies, government agencies, health agencies, and community organizations that understand the value, benefits, and processes of creating successful community engagement, the effort provides a clear return on investment.

ADDITIONAL RESOURCES

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APPENDIX: VISIONS OF TRANSFORMING STREETS

The photosimulations on these pages present images of how streets can be changed to make better places and neighborhoods. The simulations show the application of principles and concepts described throughout this manual.





Credit: Todd Clements





Credit: Todd Clements



Credit: Dan Burden

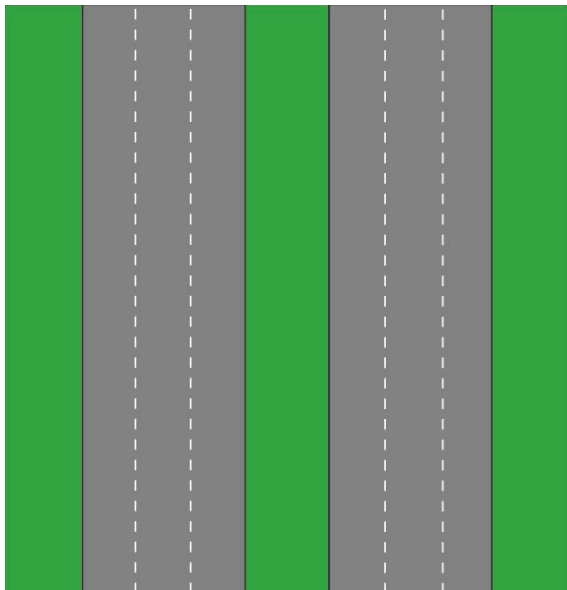


Credit: Alexis Lantz

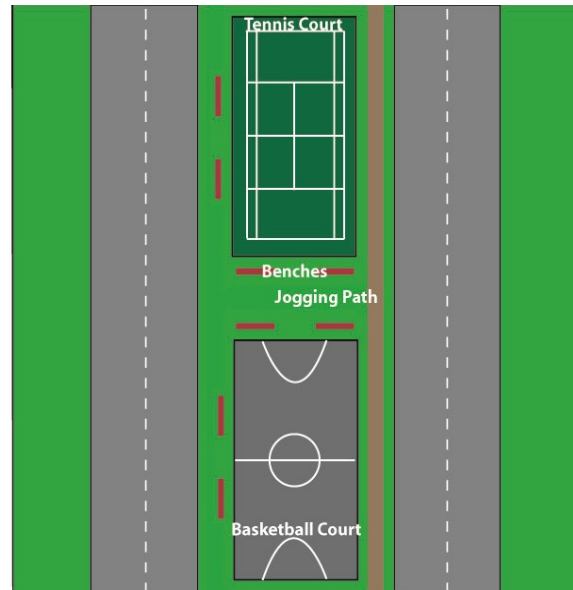


Credit: Marty Bruinsma





Existing San Vicente Blvd.



Concept for San Vicente Blvd.

(Credit: Marty Bruinsma)



(Credit: Marty Bruinsma)

Traffic Calming Classification		Framework Street			Framework Street or Non-Framework Street	Non-Framework Street
		35 mph +	25 to 30 mph	25 mph	25 to 30 mph	25 mph or below
Posted/Design/Target/Operating Speed (mph)						
Transition Zone from / to higher speed environment						
Entrance Features (architecture / landscaping / monument)						
Cross-Section Measures	Reduction in number of lanes					
	Reduction in width of lanes					
	Long Median / Continuous Median					
	Short Median / Refuge					
	Short Medians on Curves					
	Bulb-outs					
	Curb and Gutter					
	Curbless / Flush Streets					
	Flush Medians					
	Pedestrian Scale Lighting					
	Street Trees					
	Building up the right-of-way					
	Lateral Shifts					
	Bike Lanes / Protected Bike Lanes / Cycle Tracks					
	Textured and/or Colored Paving Materials (parking, lanes, bike lanes, crossings, intersections, general purpose lanes, turn lanes, medians)					
	On Street Parking	Parallel				
		Back-in-angled				
		Front-in-angled				
		Right-angle				
		Valley gutters used in conjunction with parking				
Periodic Measures	Horizontal Measures	Roundabouts				
		Mini-Roundabouts				
		Mini Traffic Circles				
		Impellers (T-intersections)				
		Two-lane chicanes				
		One-lane chicanes (yield condition)				
		Short Medians				
		Medians on curves				
	Narrowings	Yield Streets				
		Pinch Points				
		Bulb-outs				
	Vertical Measures	Raised intersections				
		Raised crosswalks				
		Flat-top Speed Humps (speed tables)				
		Speed Cushions				
		Speed Humps				
Not Traffic Calming Measures	Vertical	Rumble Strips (for warning purposes)				
	Changes	Speed Bumps				

Legend: **Appropriate**
Appropriate in Specific Circumstances
Not Appropriate

APPENDIX C
Water Quality Protection Zone (WQPZ) Ordinance

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AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA AMENDING CHAPTER 19 OF THE CODE OF THE CITY OF NORMAN TO PROVIDE FOR STANDARDS AND REQUIREMENTS FOR A DESIGNATED WATER QUALITY PROTECTION ZONE INCLUSIVE OF THE LAKE THUNDERBIRD WATERSHED; AND PROVIDING FOR THE SEVERABILITY THEREOF.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 1. That Section 19-210 of Chapter 19 of the Code of the City of Norman shall be amended to read as follows:

Sec. 19-210. Definitions.

The following words and phrases when used in this chapter, shall for the purposes of this chapter, have the meanings respectively ascribed to them in this article, except where the context otherwise requires:

- A. *Alley*: A minor right-of-way dedicated to public use, which gives a secondary means of vehicular access to the back or side of properties otherwise abutting a street, and which may be used for public utility purposes.
- B. *Best Management Practices (BMP)*: An effective integration of storm water management systems, with appropriate combinations of non-structural controls and structural controls which provide an optimum way to convey, store and release runoff, so as to reduce peak discharge, reduce pollutants, enhance water quality, assist in stream and/or stream bank stabilization, prevent property damage due to flooding, and assist in sediment reduction. BMP's include, but are not limited to, the following:
 - 1. Structural controls such as:
 - a. Sediment forebay;
 - b. Grassed swale;
 - c. Enhanced bio-swale;
 - d. Voluntary urban nutrient management;
 - e. Statutory urban nutrient management;
 - f. Wetlands;
 - g. Extended detention-enhanced;
 - h. Retention basins;

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- i. Bioretention, surface sand, organic, and similar filters;
 - j. Soaking trench;
 - k. Infiltration trench;
 - l. Storm water pond;
 - m. Dry extended detention pond; and
 - n. In-channel detention.
 - 2. Non-structural controls such as:
 - a. Landscape conservation;
 - b. Reduction in impervious cover;
 - c. Schedule of maintenance activities;
 - d. Prohibition of practices;
 - e. Maintenance procedures.
 - f. Street sweeping;
 - g. Fertilizer restrictions.
- C. *Bicycle lane*: That portion of a roadway set aside and appropriately designated for the use of bicycles.
- D. *Bicycle path*: A paved facility physically separating the bicycle from motor vehicle traffic.
- E. *Block*: A parcel of land, intended to be used for urban purposes, which is entirely surrounded by public streets, highways, railroad rights-of-way, public walks, parks or greenstrips, rural land or drainage channels or a combination thereof.
- F. *Buffer*: A vegetated area, including trees, shrubs, and herbaceous vegetation that exists or is established to protect a stream system, lake or reservoir, reduce pollutants, enhance water quality, assist in stream and/or stream bank stabilization, and assist in sediment reduction.
- G. *Building line*: A line parallel to the lot or property line beyond which a structure or building cannot extend, except as specifically provided under the zoning ordinance. It is equivalent to the setback or yard line.
- H. *Cluster development*: cluster development is a method of subdividing land which allows the maximum density available within the zoning district while allowing smaller lots than those specified, provided that the land saved is reserved for permanent agricultural use or open space, ideally in common ownership for community use.

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- I. *Combustible structure*: That which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner and consisting of any material that, in the form in which it is used and under the conditions anticipated, will ignite and burn or will add appreciable heat to an ambient fire.
- J. *Degradation*: any condition caused by the activities of humans which result in the prolonged impairment of any constituent of the aquatic environment.
- K. *Development*: The erection, construction, or change of use of buildings; or the erection or construction of any additions to existing buildings where outer walls are added or altered as to location, but not including alterations or remodeling of buildings where said outer walls are not added or altered as to location. As it relates to water quality protection, any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation, drilling, or storage of equipment or materials.
- L. *Development committee*: The City of Norman Development Committee shall be comprised of the following staff members: The Director of Public Works (who shall be the chairman), the Director of Planning and Community Development, the Director of Utilities, the City Engineer, the Development Coordinator, and the Manager of Current Planning, or their designees.
- M. *Director of Public Works*: The Director of Public Works of the City of Norman, including his or her designee.
- N. *Easement*: A grant by the property owner to the public, a corporation, or persons, of the use of an area of land for specific purposes.
- O. *Impervious Cover*: Roads, parking areas, buildings, pools, patios, sheds, driveways, private sidewalks, and other impermeable construction covering the natural land surface. This shall include, but not be limited to, all streets and pavement within a subdivision. Vegetated water quality basins, vegetated swales, other vegetated conveyances for overland drainage, areas with gravel placed over pervious surfaces that are used only for landscaping or by pedestrians, and public sidewalks shall not be calculated as impervious cover.

- P. *Lot*: A subdivision of a block or other parcel intended as a unit for the transfer of ownership or for development.
- Q. *Lot, corner*: A lot which abuts two (2) intersecting streets. The front of a lot is defined by the filed plat of the subdivision, and is addressed accordingly. Although the front door of the house should face the front yard, a house may be oriented towards the side street if the plat was designed to provide two (2) front and rear yards or if there is sufficient room to provide both a new front and rear setback.
- R. *Lot, depth*: The average distance from the front property line of the lot adjacent to the street to its rear property line, measured in the general direction of side lines of the lot.
- S. *Lot, double frontage*: A lot which runs through a block from street to street and which has frontage on two (2) or more streets, but not including a corner lot.
- T. *Lot, reverse frontage*: A corner lot of such size and shape that a building erected on it might logically be designed to face on either adjoining street, thus causing the building to rear on the side line of any abutting lot.
- U. *Lot, townhouse*: A lot shown on a townhouse plat and intended as the site of a single attached dwelling unit.
- V. *Lot line adjustment*: A relocation of the lot lines of two (2) or more lots included in a plat which is filed of record, for the purpose of making necessary adjustments to building sites.
- W. *Low Impact Development (LID)*: a comprehensive land planning and engineering design approach to development that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives.
- X. *Non-degradation*: The proper use of BMP's and pollution prevention criteria in activity so as to prevent property damage due to flooding and degradation as defined herein.
- Y. *Non-structural controls*: Pollution prevention measures that focus on the management of pollutants by practices and procedures which minimize exposure to runoff, as well as preserve open space and natural systems. Non-structural controls may include riparian buffers,

modified development practices, and regulations on pesticide, herbicide, and fertilizer use.

Z. *Norman 2025 Plan*: The comprehensive development plan for the City of Norman which has been officially adopted to provide long-range development policies for the City in the foreseeable future and which includes, among other things, the plan for land use, land subdivision, traffic circulation and community facilities, utilities, and drainage facilities.

AA. *Person*: Any natural person, corporation, partnership, joint venture, association (including homeowners or neighborhood associations), trust, or any other entity recognized by law.

BB. *Planning Commission*: The City Planning Commission of the City of Norman.

CC. *Plat, final*: A map of a land subdivision giving, in form suitable for filing in the office of the County Clerk, necessary affidavits, dedications, and acceptances, and delineating the layout of such subdivision as required herein.

DD. *Plat, preliminary*: A map of a proposed subdivision showing the character and proposed layout of the tract in sufficient detail to indicate the relationship of the proposed development to topography, existing streets, drainage facilities and utilities, existing easements of record, the Norman 2025 Plan, existing urban development and zoning, and to indicate the nature of the land planning design.

EE. *Pollution*: the contamination or other alteration of the physical, chemical or biological properties of any stream or other water source, or such discharge of any liquid, gaseous or solid substance into any stream or other water source as will or is likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

FF. *Public improvements*: Any utility, structure, or modification of topography which is, or will be, located within, under, or over a right-of-way or easement of record and which is, or will be, owned and/or maintained by other than the individual owner(s) of developed real estate.

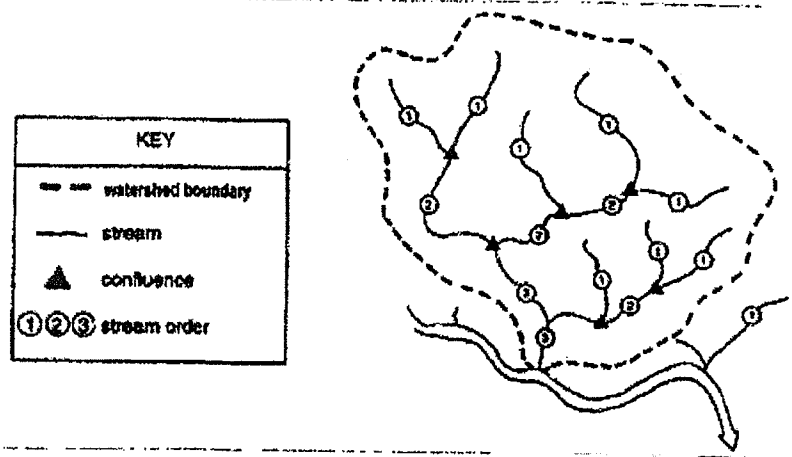
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- GG. *Raised mound septic system*: a soil absorption system that is elevated above the natural soil surface in a suitable fill material. It is a variation of the raised bed utilizing sandy fill material but not requiring a stabilization period prior to the construction of the absorption area.
- HH. *Raised septic system*: a wastewater absorption trench system which has been constructed in soil fill material which has been placed on top of the natural soil on a building lot.
- II. *Reserve strip*: A strip of land located adjacent to a public easement or right-of-way which has the effect of denying access to adjacent property owners to said public easement or right-of-way.
- JJ. *Right-of-way*: Any street, avenue, parkway, highway, boulevard, road, alley, bicycle path or pedestrian walkway reserved and/or dedicated for public or private use chiefly by vehicular or pedestrian traffic. Its width shall be established as the shortest horizontal distance measured between lines delineating the right-of-way.
- KK. *Rural and suburban area*: All that part of the incorporated area of the City of Norman which is not classified on the Norman 2025 Plan for urbanization.
- LL. *Setback line*: See building line or yard line.
- MM. *Site development plan*: A plan drawn at a scale of not less than fifty (50) feet equal one (1) inch which shows the topographic characteristics of the site not more than a one (1) foot contour interval in the urban areas and not more than two (2) feet contour intervals in the rural areas; the location and dimensions of buildings, yards, courts, landscape, pedestrian and vehicular circulation and parking, fences and screening; service areas and service courts, and other features; the use of each building and area; the height of buildings; adjacent street, alleys, utility, drainage and other easements; and the relationship of the development to adjacent areas which it may affect.
- NN. *Streams*: Watercourses that are either identified through site inspection and/or notification by the United States Army Corp of Engineers or by the United States Geological Survey (USGS) 7.5 minute series (topographic) maps drawn at a scale of 1:24,000 or 1 inch = 2000 feet. Perennial streams are those which are depicted on a USGS map with a solid blue line. Intermittent streams are those which are depicted on a USGS map with a dotted blue line.

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OO. *Stream Order*: A method of numbering streams as part of a drainage basin network. Tributaries which have no branches are designated as of the first order, streams which receive two first-order tributaries are of the second order, larger branches which receive two second-order tributaries are designated third order, and so on, the main stream being always of the highest order. Designation of stream order shall be determined utilizing a USGS 7.5 minute series (topographic) map drawn at a scale of 1:24,000 or 1 inch = 2000 feet. See Figure 1 below.

Figure 1: Stream Order (Source: Schueler, 1995)



PP. *Stream Planning Corridor (SPC)*: the areas of land designated as an SPC in Exhibit 4-4 to the PBS&J Storm Water Master Plan dated October 2009 along both sides of a stream or natural drainage corridor that encompasses the area projected to be inundated by the one-percent (1%) chance flood event (i.e. the 100-year floodplain) in any given year assuming full build-out watershed conditions (based upon the Norman 2025 Plan and subsequent updates) in those areas with 40 or more acres of drainage area in the Lake Thunderbird watershed.

QQ. *Street*: Any public or private right-of-way which affords the primary means of access to abutting property.

RR. *Street, collector*. A minor street collecting traffic from other minor streets and serving as the most direct route to a major street or community facility.

SS. *Street, cul-de-sac*: A local street having one (1) closed end terminated by a turn-around.

- TT. *Street, estate type*: A local street in a Residential Estate (R-E) or Agricultural (A-1, A-2) zone or district.
- UU. *Street, frontage or service*: A minor street located adjacent and parallel to a major street for land service to abutting properties and access to adjacent areas and for allowing control of access to the major street.
- VV. *Street, local*: A minor street which collects and distributes traffic between parcels of land and collector or arterial streets, with the principal purpose to provide access to abutting property.
- WW. *Street, major*: A freeway, principal arterial, or minor arterial designated on the adopted Transportation Plan of the City of Norman.
- XX. *Street, minor*: Any street other than one (1) designated as a freeway, principal arterial, or minor arterial on the adopted Transportation Plan of the City of Norman, but not including alleys.
- YY. *Street, public*: Any pre-existing county road heretofore annexed by the City of Norman and which forms a part of said City by reason of such annexation, or any street or road granted or dedicated to and accepted by the City of Norman.
- ZZ. *Structural controls*: engineered solutions designed to reduce pollution in surface water runoff primarily through five basic mechanisms: infiltration, amelioration, treatment, filtration and detention. In effect, these systems attempt to counteract the opposite tendencies of decreased infiltration, filtration and detention which urbanization imposes upon the land.
- AAA. *Subdivider (developer)*: Any person, firm, partnership, corporation, or other entity acting as a unit, subdividing or proposing to subdivide or develop land as herein defined.
- BBB. *Subdivision*: The division, re-division, or delineation of land by lots, tracts, sites or parcels for the purpose of transfer of ownership, or for urban development, or for the dedication or vacation of a public or private right-of-way or easement.
- CCC. *Swale*: A natural depression or wide shallow ditch used to temporarily store, route, or filter runoff and encourage infiltration.

- DDD. *Top of bank*: The point along a stream bank where abrupt change in slope is evident, and where the stream is generally able to overflow the banks and enter the adjacent floodplain. The top of bank may be identified from topography maps but must be verified through field inspection. Where no top of bank is discernable by the City Storm Water Engineer or his designee, measurements should be taken from the center line of the stream.
- EEE. *Transportation Plan*: The arrangement, character, extent, and width of major streets within the City of Norman as designated on the most currently adopted Land Use and Transportation Plan document.
- FFF. *Townhouse*: One (1) of a series of two (2) or more attached dwelling units, separated from one (1) another by continuous, vertical party walls without openings from basement floor to the roof deck and tight against same or through the roof and which are intended to have ownership transferred in conjunction with a platted lot.
- GGG. *Urban area*: All that part of the incorporated area of the City of Norman which is designated on the Norman 2025 Plan for urbanization.
- HHH. *Water Quality Protection Zone (WQPZ)*: A vegetated strip of land that lies along a Stream or Lake Thunderbird and its adjacent wetlands, floodplains or slopes that is comprised of the stream bed and areas adjacent to the stream bed and the distance of which is determined by Section 19-411(B), (C) and (D) herein.
- III. *Way*: Any street, avenue, parkway, highway, boulevard, road, alley, bicycle path or pedestrian walkway reserved and/or dedicated for public or private use chiefly by vehicular or pedestrian traffic. Its width shall be established as the shortest horizontal distance measured between lines delineating the right-of-way.
- JJJ. *Wetland*: the term, as used herein, shall have the same meaning as set forth in 40 C.F.R. §230.3.
- KKK. *Yard line*: An open space at grade between a building and the adjoining lot lines, unoccupied and unobstructed by any portion of a structure from the ground upward except as specifically provided in Chapters 18 or 22. In measuring a yard for the purpose of determining the width of the side yard, the depth of a front yard, or the depth of a

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rear yard, the least horizontal distance between the lot line and the main building shall be used.

LLL. *Yard line, front.* A yard extending the full width of a lot between the side property lines and being the minimum horizontal distance between the street side property line and the main building or any projection thereof.

MMM. *Yard line, rear:* A yard extending across the rear of a lot measured between side yard lines and being the minimum horizontal distance between the rear lot line and the rear of the main building or any projections other than steps, unenclosed balconies or unenclosed porches. On corner lots the rear yard shall be considered as parallel to the street upon which the lot has its least dimension. On both corner lots and interior lots the rear yard shall in all cases be at the opposite end of the lot from the front yard.

NNN. *Yard line, side:* A yard between the building and the side line of the lot and extending from the front yard line to the rear lot line and being the minimum horizontal distance between a side lot line and the side of the main building or any projections other than steps.

- § 2. That Section 19-303 of Chapter 19 of the Code of the City of Norman shall be amended to read as follows:

Sec. 19-303. Preliminary Plat: Contents.

The preliminary plat shall be drawn at a scale of not more than one hundred (100) feet to the inch, except where impractical and shall show:

- A. The scale, north arrow, date and legend;
- B. The proposed name of the subdivision;
- C. The name and address of the owner of record, the subdivider, the owner's engineer, and the registered land surveyor preparing the plat;
- D. Legal description of the proposed subdivision, including the acreage and the number of lots proposed in the subdivision, by type;
- E. A key map showing the location of the proposed subdivision referenced to existing or proposed arterial streets or highways and to government section lines, and including the boundaries and number of acres of the drainage area of which the proposed subdivision is a part;

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- F. The names, with locations of intersecting boundary lines, of adjoining subdivisions, and the location of the Norman City limits if falling within or immediately adjoining the tract;
- G. The land contours with vertical intervals of one foot in the urban areas and two (2) feet in the rural areas referenced to a United States Geological Survey datum (1988) or Coast and Geodetic Survey bench mark or monument;
- H. The location of dedicated streets at the point where they adjoin and/or are immediately adjacent; but actual measured distances shall not be required;
- I. Important features such as existing permanent buildings; large trees (a minimum eight (8) inch caliber); streams; railway lines; oil and gas line or wells as shown on the records of the Oklahoma Corporation Commission (including abandoned gas or oil wells and dry holes which remain unplugged);
- J. The location of all existing easements of record, sanitary and storm sewers, water mains, streets, culverts, power lines, and other surface or subsurface structures within the tract or immediately adjacent thereto, and the proposed location, layout, type, and size of the following structures and utilities:
 - 1. Water mains;
 - 2. Sanitary sewer mains, sub-mains and laterals;
 - 3. Storm sewers; and,
 - 4. Street improvements.
- K. The location of all drainage channels and subsurface drainage structures, and the proposed method of disposing of all run-off from the proposed subdivision, and the location and size of all drainage easements relating thereto, whether they be located within or outside of the proposed plat;
- L. The length of the boundaries of the tract, measured to the nearest foot, and the proposed location and width of streets, alleys, easements, and setback lines, and the approximate lot dimensions;

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- M. The existing zoning and proposed changes of zoning in the tract and of the property immediately adjacent thereto;
- N. One hundred (100) year flood boundaries;
- O. Water Quality Protection Zone boundaries;
- P. Preliminary drawings showing compliance with the applicable requirements of this Chapter for structural controls on development;
- Q. A topographic map, drawn to a scale of one hundred (100) feet to one inch, or in an appropriate scale. The map should display, according to the best information available, topographic information and features (including, but not limited to, faults and fractures along waterways, wetlands, and sinkholes), and the WQPZ. Current limits of the FEMA floodplain and the SPC shall be displayed;
- R. Location of all temporary and permanent runoff detention basins, constructed and altered waterways and other physical facilities to be installed to comply with the terms of this ordinance;
- S. Location of all existing monitoring stations, sample points or other significant devices used in measuring or assuring water quality;
- T. Any technical surveys or studies necessary to support a request for modification of WQPZ boundaries affecting the subject parcel;
- U. In the instance where there is one (1) or more active oil and/or gas well(s), lease road(s), tank batteries, flow lines, gas sales lines, dead man anchors or any other related equipment, located within a proposed preliminary plat, any and all such items shall be shown on the submitted preliminary plat. Both existing conditions and any proposed changes to the existing conditions must be indicated on the preliminary plat. The information shall include, but not be limited to well access, size of the well location, including appurtenant equipment, any change in lay out or operations of the well site such as relocation of the lease road or moving of the tank batteries and flow lines, fencing, easements for flow lines, gas sales line, communication cables, and electric power lines. The information must also stipulate the parties responsible for constructing any lease road and approach and fencing. Easements necessary to provide for flow lines, gas sales lines, power supply lines and communication cables must be designated in writing. All information required must be shown on a site plan that has been reviewed and approved for compliance with oil and gas ordinances. A

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copy of the site plan shall be provided to the oil and gas inspector to become part of the well records until such time of the plugging and restoration of well location(s) has been completed. Oil well operators shall be notified by the oil and gas inspector of any predevelopment informational meeting(s) as an interested part where a preliminary plat contains a well(s), lease road, tank battery, flow line, gas sales line, dead man anchors, or any other related equipment that they operate. Notice shall be given in the same format as property owners within the required notice area.

§ 3. That Section 19-308(E) of Chapter 19 of the Code of the City of Norman shall be amended to read as follows:

E. In the case of a plat proposing the reserving or dedicating of land or amenities to be used in common by owners of lots in a single-family residential subdivision, or in the case of a plat or Norman Rural Certificate of Survey that contains any portion of the WQPZ, the applicant shall submit evidence acceptable to the City Attorney that all necessary steps have been taken for:

1. The establishment of a mandatory Property Owner's Association ("POA") or establishment of another acceptable arrangement for adequate maintenance of the common elements and any designated non-structural controls for storm water management. All mandatory POAs shall submit a Declaration of Covenants, Conditions and Restrictions (the "Declaration") which establishes a minimum framework that provides for the fair and effective administration of the POA and thereby assures the greater likelihood that the interests of the City and its citizens are secure and which include the following provisions:

a. A list of all common property in the plat, by legal description. A specific description of all of the common elements within the subdivision including any abutting arterial roadways, the uses allowed for each common element and a description of the person responsible for initially constructing or installing each common element and the responsibility for maintaining the common element after initial installation;

b. In those plats containing any portion of the WQPZ, a list of any non-structural controls located on the property.

* * * * *

§ 4. That Section 19-411 of Chapter 19 of the Code of the City of Norman shall be added to read as follows:

Sec. 19-411. Water Quality Protection Zone Design Standards.

- A. The Water Quality Protection Zone (WQPZ) for a stream system shall consist of a vegetated strip of land, preferably undisturbed and natural, extending along both sides of a stream and its adjacent wetlands, floodplains, or slopes. The width shall be adjusted to include contiguous sensitive areas, such as steep slopes, where development or disturbance may adversely affect water quality, streams, wetlands, or other water bodies.
- B. The required base width for all WQPZ's shall be equal to:
1. The greater of the following:
 - a. 100 feet in width, measured from the top of the bank, on either side of the stream; OR
 - b. The designated Stream Planning Corridor as delineated on Exhibit 4-4 to the Storm Water Master Plan, dated October 2009 and accepted by City Council on November 10, 2009 and as available on the appropriate scale through the Public Works Department, or as indicated by the Applicant's independent engineering analysis ; OR
 - c. The FEMA Floodplain; OR
 2. An alternative width equal to 25 feet in width, measured from the top of the bank, on either side of the stream when a reduction in nitrogen of at least 75% and a reduction in phosphorus of at least 58% is achieved through the use of an engineered process that is certified by a licensed Professional Engineer. A development plan using an alternative width less than the SPC shall also document protection against flooding and bank erosion that would be anticipated during the 1% chance flood event in an given year assuming full build-out watershed conditions in those areas with 40 or more acres of drainage area in the Lake Thunderbird watershed. For the purpose of determining the applicable reduction in the base width of the buffer, the table below may be utilized to determine pollutant removal for a particular structural control, as long as such control is constructed in accordance with the specifications for said control contained in Wichita/Sedgwick County Stormwater Manual.

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Table of Design Pollutant Removal Efficiencies for Storm Water Controls (%)				
Structural Control	Total Suspended Solids	Total Phosphorus	Total Nitrogen	Metals
Storm Water Pond	80	55	30	50
Dry Extended Detention Pond	60	35	25	25
Enhanced Dry Swales	90	50	50	40
Grass Channel	50	25	20	30
Infiltration Trench	90	60	60	90
Soaking Trench	90	60	60	90
Vegetative Filter Strips	50	20	20	40
Surface Sand Filters	80	50	30	50

- C. For each portion of any 25 foot segment of the buffer, as set forth in Section 19-411(B), that has a slope over 20%, 25 feet shall be added to the width of the WQPZ. To determine the extent of steep slopes, a cross section of the topography every 100 feet shall be prepared and utilized by the Applicant.
- D. In second-order streams with continuous water or in higher order streams, 25 feet shall be added to the base width outlined in Section 19-411 (B) above.
- E. Drainage easements, of sufficient size to carry the runoff of a 1% chance flood event from all drainage areas on the Plat greater than forty (40) acres within the WQPZ must be shown on dotted lines on the Preliminary and Final Plats, along with a written legal description of any such easement, all certified by a licensed Professional Engineer. Such easement shall be granted to the City of Norman for the purpose of access for inspecting, repairing, and maintaining drainage channels.
- F. For all developments, particularly those containing some portion of the WQPZ, utilization of low impact development strategies are encouraged. For plats or Norman Rural Certificates of Survey that include portions of the WQPZ, the current Engineering Design Criteria may be modified when Low Impact Development strategies are utilized in accordance with City of Wichita/Sedgwick County Stormwater Manual.
- G. Water Pollution Hazards. The following land uses and/or activities are designated as potential water pollution hazards and must be set back from the top of the bank of any stream or waterbody by the distance indicated below:

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1. Storage of hazardous substances—(300 feet)
 2. Aboveground or underground petroleum storage facilities—(300 feet)
 3. Drainfields from onsite sewage disposal and treatment systems (i.e., septic systems)—(200 feet)
 4. Raised septic systems and raised mound septic systems—(500 feet)
 5. Solid waste landfills or junkyards—(600 feet)
 6. Subsurface discharges from a wastewater treatment plant—(200 feet)
 7. Land application of biosolids—(200 feet)
- H. WQPZ Design Restrictions. Except as required for initial construction, there shall be no clearing, grading, construction that disturbs vegetation on any portion of the WQPZ, the width of which is determined by Section 19-411(B), (C) and (D) herein. Any development containing a WQPZ shall not be designed to contain within that zone any permanent structures or portions of septic systems, except for structural controls or other enhancing design features that will further the objectives of this ordinance.
- I. All applications for preliminary plats and Norman Rural Certificates of Survey that contain any portion of property within the WQPZ shall also submit a report outlining the Best Management Practices to be employed.
- § 5. That Section 19-514 of Chapter 19 of the Code of the City of Norman shall be added to read as follows:

Sec. 19-514. Water Quality Protection Zone Management and Maintenance.

- A. All preliminary plats, final plats, and Norman Rural Certificates of Survey shall clearly:
1. Show the extent of any WQPZ on the subject property.
 2. Label the WQPZ.
 3. Provide a note to reference any WQPZ stating: "There shall be no clearing, grading, construction or disturbance of vegetation

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except as permitted by the Director of Public Works unless such disturbance is done in accordance with 19-514(E) of the Norman City Code.

4. Provide a note to reference any protective covenants governing all WQPZ areas stating: "Any WQPZ shown hereon is subject to protective covenants that may be found in the land records and that restrict disturbance and use of these areas."
 5. All subdivisions containing a WQPZ area shall ensure maintenance of the non-structural controls/aspects in the WQPZ area by its Property Owners' Association through the filing of a protective covenant, which is required to be submitted to the City Attorney's office for approval. The covenant shall be recorded in the land records and shall run with the land and continue in perpetuity. Any changes to the covenants and restrictions shall be consistent with the provisions herein.
- B. An offer of dedication of a WQPZ to the City of Norman does not convey to the general public the right of access to this area unless such a right is explicitly set forth in said dedication. Further, an offer of dedication of a WQPZ is not a mandate for a public trail system or any portion thereof.
 - C. The Public Works Department shall inspect the buffer annually and following severe storms for evidence of sediment deposition, erosion, or concentrated flow channels and corrective actions taken to ensure the integrity and functions of the WQPZ.
 - D. Any portion of the WQPZ that is within thirty (30) feet of a combustible structure shall be maintained (regardless of the underlying zoning designation) as provided in Section 10-209.
 - E. Portions of the WQPZ that are not within thirty (30) feet of a combustible structure may be left undisturbed and natural, and in no event, shall grassy vegetation in this area be mowed or otherwise cut down to less than six (6) inches tall.
- § 6. That Section 19-601 of Chapter 19 of the Code of the City of Norman shall be amended to read as follows:

Sec. 19-601. Variations.

- A. Occasionally the tract to be subdivided is of such unusual size or shape or is surrounded by such development or unusual conditions that the strict application of the requirements contained in this chapter would result in substantial hardship or inequity. The City Council may vary or modify, except as otherwise indicated, such requirements of design, but not of procedure or public improvements, so that the subdivider may develop the subject property in a reasonable manner. At the same time, the public welfare and interests of the City must be protected and the general intent and spirit of this chapter are preserved by granting such variance. Such modification may be granted upon written request of the subdivider or the subdivider's engineer, stating the reason for each modification, and may be approved by vote of the regular membership of the City Council, with the recommendation of the Planning Commission, subject to the acceptance of the plat and the dedications thereon by the City Council; provided, however, that a variation based on unique condition(s) shall not be granted when the unique condition(s) was created or contributed to by the subdivider.
- B. WQPZ Averaging. The width of the WQPZ may be reduced in some circumstances to accommodate unusual or historical development patterns, shallow lots, stream crossings, or storm water ponds. Any averaging of the WQPZ must be done in accordance with the following:
1. An overall average WQPZ width of at least the base width as determined in 19-411(B) must be achieved within the boundaries of the property to be developed. The WQPZ on adjoining properties cannot be included with buffer averaging on a separate property, even if owned by the same property owner.
 2. The average width must be calculated based upon the entire length of stream bank that is located within the boundaries of the property to be developed. When calculating the WQPZ length, the natural stream channel should be followed.
 3. WQPZ averaging shall be applied to each side of a stream independently. If the property being developed encompasses both sides of a stream, WQPZ averaging can be applied to both sides of the stream, but must be applied to both sides of the stream independently, unless the natural topography of the stream makes one side of the stream not conducive to the establishment of a WQPZ and in that event, averaging using both sides may be utilized.

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4. WQPZ averaging is prohibited in developments that have, or will have after development areas that have slopes greater than 15% that are located within fifty feet of the stream to be buffered.
 5. Appeal from Decision of Public Works Director. If the applicant desires to appeal from the decision of the Public Works Director or his or her designee made in accordance with this subsection, the applicant may file such request, and any documentation supporting said appeal, with the City Clerk. The City Clerk will place the appeal on the agenda of the next available regular City Council meeting. The decision of the Public Works Director, or his or her designee, may be upheld or overturned by vote of the regular membership of the City Council.
 - C. Whenever infrastructure has been installed that will benefit the full build-out of a Preliminary Plat which was approved within five (5) years prior to the effective date of this ordinance, the Preliminary Plat shall not be deemed expired, for purposes only of the application of this ordinance, even after the passage of three (3) years from the date of approval of the Preliminary Plat, or five (5) years from the date of approval of the Preliminary Plat if a Final Plat has been filed on part of the land embraced in the Preliminary Plat.
- § 7. That Section 19-606 of Chapter 19 of the Code of the City of Norman shall be amended to read as follows:

Sec. 19-606 Exception to allow Norman Rural Certificates of Survey as plats in A-1 and A-2 Zoning Districts.

A. It is the purpose of this exception to allow lots of ten (10) acres or more to be developed and sold adjacent to public or private roadways in the A-1 and A-2 Agricultural Districts; however, private roadways should be constructed and maintained in such a manner that said roadways may be traversed and used by police, fire and other official vehicles of all municipal, county, state and federal agencies. Lots created under this process shall be designated as "Norman Rural Certificate of Survey Subdivisions" and may be permitted under the following procedures (Ord. No. O-0203-34):

- * * * * *
2. An accurate survey of the lot, prepared by a land surveyor registered in the State of Oklahoma, and the proposed subdivision thereof shall be submitted to the Public Works Department and shall show the same information required for a preliminary plat as referenced in Section 19-303 of this Code, except the ground

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contours may be drawn at five-foot intervals in such cases where the average ground slope is three (3) percent or greater.

* * * * *

§ 8. If the provisions of any existing section of Chapter 19 conflicts with any section of this Water Quality Protection Zone ordinance, then the provisions of this ordinance O-1011-52 will control and prevail.

§ 9. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance, except that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this 28th day

NOT ADOPTED this _____ day

of June, 2011.

of _____, 2011.

Cindy Rosenthal
Cindy Rosenthal, Mayor

Cindy Rosenthal, Mayor

ATTEST:

Brenda Hall
Brenda Hall, City Clerk



APPENDIX D
Fee Schedule

	DATE	SECTION	COMMENT	RESPONSE	Uploaded Response
1	10/10/2022 10:00	General (1000)-1	Pipe depth or depth of cover is measured between the finished grade elevation and the top of pipe.	Yes, that is correct. This definition will be updated to state "Pipe depth or depth of cover shall mean the difference between the finished grade elevation and the top of the pipe."	12/5/2022
2	10/10/2022 10:02	General (1000)-2	1002.2 - 22"x34" is antiquated and the City has accepted 24"x36" hard copies and digital. Revise this comment to require 24"x36" standard sheets.	This reference will be updated to reflect 24"x36" standard sheets.	12/5/2022
3	10/10/2022 10:03	General (1000)-3	1002.17 - Define 'proposed elevations'.	Elevations means the elevations of the proposed site improvements and alterations after construction.	12/5/2022
4	10/10/2022 10:06	General (1000)-4	1002.19 B. - What is the purpose of the as-built Driveway grades? Driveway grades are not typically included in the as-built drawings submitted to the City and the City has not been requiring this information.	When driveways and/or curb returns are constructed with the development, they are required to be shown on the as-builts.	12/5/2022
5	10/10/2022 10:09	General (1000)-5	1004.2 D. - Flumes are allowed by the City to drain two (2) or more lots.	This statement clarifies that overland drainage is appropriate for no more than 3 lots or 1/2 acre (whichever is less). This approach ensures consistency even with varying lot sizes. (also see 5003.6)	12/5/2022
6	10/10/2022 10:11	General (1000)-6	1007.1 - The language in the 1st paragraph is a carry-over from the existing Standards. Please explain the condition "those supporting 1-foot of soil or more" with the 3-foot or more retaining wall requirement.	We propose to update this statement to read "those supporting 2-foot of soil or more, measured from top of footing to top of wall."	12/19/2022
7	10/10/2022 10:14	Water Lines (2000)-1	2002.4 - Last sentence "The additional costs for the upsizing shall be determined by the Utilities Engineer and may participate in a cost sharing of the construction." If the City requires the upsizing, then the City should participate in the additional costs to the developer. Replace "may" with "shall".	This statement clarifies the existing process for upsizing mains. The City is responsible for making any determination related to cost sharing arrangements. Because each situation is unique, the term "may" is appropriate.	12/5/2022
8	10/10/2022 10:16	Sanitary Sewer (3000)-1	3002.7 - The City has allowed depths to 18-feet. Consider changing the depth from "12-feet" to "18-feet".	Pipe installations at depths greater than 12 feet below ground surface may be allowed with approval of the Utilities Engineer.	12/5/2022
9	10/10/2022 10:20	Streets (4000)-1	4004.10 B. - The text in par. B should match the table shown in par. F. A 1 to 1 scale "without exaggeration" is not always achieved on 24"x26" P&P and X-Section detail sheets.	Paragraph B covers the information to be displayed on the sheets and paragraph F covers the intended scale. 1:1 (no exaggeration) sheets are standard in Oklahoma and fit on typical 22x34 or 24x36 sheets.	12/5/2022
10	10/10/2022 10:21	Streets (4000)-2	4010.4 - Link error in paragraph.	This link will be updated.	12/5/2022
11	10/10/2022 10:25	Streets (4000)-3	Streetlights are not typically determined at the Preliminary Plat stage for residential subdivisions. Showing streetlights require coordinating the light design/engineering with the franchised vendor and the lights locations are likely to change by the time a Section is Final Platted. The requirement to show the streetlights on the Preliminary Plat should be removed.	This statement will be amended. Streetlights are not required to be shown on Preliminary Plats.	12/5/2022
12	10/10/2022 10:27	Stormwater (5000 & 6000)-1	5003.6 - Flumes are allowed by the City to drain two (2) or more lots (same requirement in 1004.2 D).	This statement clarifies that overland drainage is appropriate for no more than 3 lots or 1/2 acre (whichever is less). This approach ensures consistency even with varying lot sizes. (also see 5003.6)	12/5/2022
13	10/11/2022 10:45	Water Lines (2000)-2	2002.8 Sand back fill is more than adequate for backfill. Adding rock requirement raises cost and provides zero benefit.	Current specifications require Type A Aggregate, flowable fill, or recycled concrete for installations under driving surfaces. There are no proposed changes to the current requirements.	12/5/2022
14	10/11/2022 10:46	Water Lines (2000)-3	2002.3 7.5' separation provides enough distance and should not be changed to 10'.	Subcommittee consensus was to define the requirement of installing water lines no closer than 10 feet from a structure. This was to clarify situations where the building roof or canopy overhangs the structure and may create an obstruction for maintenance equipment.	12/5/2022
15	10/11/2022 10:48	Stormwater (5000 & 6000)-2	6004.2 - L. What are the proposed inspection standards for stormwater in terms of frequency?	Following OKR10: "Routine facility inspections must be conducted at the following frequencies: • once every 14 calendar days; and • within 24 hours of the end of a storm event of 0.5 inches or greater; and • within 24 hours of a discharge generated by snow-melt."	12/5/2022
16	10/11/2022 10:49	Stormwater (5000 & 6000)-3	6004.2 - G. Need to define stabilization as above water level. Bottoms of sedimentation basins that are also ponds cannot be stabilized if they are wet.	This language will be clarified regarding stabilization zones for wet ponds.	12/5/2022

	DATE	SECTION	COMMENT	RESPONSE	Uploaded Response
17	10/31/2022 11:00	Stormwater (5000 & 6000)-4	500 year flood plain requirements needs to be reviewed before City Council approval for the updated EDC. We think that this new criteria will affect our design of our new development substantially. Also the following new requirements needs to be considered and reviewed prior to any City Council Approval: 1. Soil Conservation method to size detention ponds 2. Fee in Lieu of Detention 3. Requirements on specie of fish in pond 4. requirments of integrated pest management in pond	We will update the reference to the 500-year floodplain to state "100-year with 1 foot of freeboard unless more stringent OWRB dam safety requirements control, as outlined in title 785:25-3-3." 1. Section 5005.3 is referenced to use for design requirements of ponds stating use of the SCS method to size ponds 2. 5012.4 discusses fee in lieu of detention 3. The required fish species criteria are stated in section 7004.3; additionally, the City will accept the introduction of species as recommended by the OK Department of Wildlife Conservation. 4. Integrated pest management is discussed in 7010.2	12/5/2022
18	10/31/2022 11:04	General (1000)-7	"As Built Plans Required on Driveway slopes." This new requirement needs to be discussed prior to be added to the updated EDC.	When driveways and/or curb returns are constructed with the development, they are required to be shown on the as-builts.	12/5/2022
19	11/29/2022 13:25	Sustainable Development (7000)-1	Please consider the natural environment before introducing new methods for handling stormwater runoff. Mosquitos can breed in standing water so plans to mitigate that issue should be made when designing retaining ponds and wetlands.	Recommended designs include best practices for addressing mosquitoes and other potential adverse impacts of innovative stormwater controls.	12/19/2022
20	11/29/2022 13:27	Stormwater (5000 & 6000)-5	Please consider the natural environment before introducing new methods for handling stormwater runoff. Mosquitos can breed in standing water so plans to mitigate that issue should be made when designing retaining ponds and wetlands.	Recommended designs include best practices for addressing mosquitoes and other potential adverse impacts of innovative stormwater controls.	12/19/2022
21	11/30/2022 11:00	Stormwater (5000 & 6000)-6	NOT to allow new construction to put their water drain off pond to where it will drain towards other property owners. CON should NOT allowed a earth change when it comes to water. Water will runs its course naturally. Allowing the run off drain to be within FEET of existing properties will only flood them in time! I am that neighbor and I have been taking video and pictures so when that day does happen I will have proof to win in court. 😊. CON needs change & Not at cost of the property owners!	Detention ponds typically discharge at the historic discharge point or lowest point on the property. Staff work with developers and consultants to minimize impacts on adjacent properties.	1/26/2023
22	12/2/2022 19:59	General (1000)-8	Are the population projections from 2004 to 2025 happening in real time? Or is this a "if we build it they will come" plan. Either way all new construction home/office/industrial the developers should incur all expenses for water/sewer improvements, include small batch sewage plants & potable water & bridge improvements. satellite Fire/Police/EMT facilities. Is Lake Thunderbird filling up with sediment faster than predicted? How many years are left for the Lakes viability as our water source?	This project does not address population projections or long-range planning concepts. The EDC update will specifically address engineering design practices to implement adopted plans and policies.	12/19/2022
23	12/2/2022 20:06	Stormwater (5000 & 6000)-7	Is global climate change a reality or are we sticking our collective heads in the sand leaving our derrieres' in the air? With the increased storms world wide and the flooding that comes with it locally are we planning for the worst scenario?	This project is focused on updating the City's technical manuals that address the design and installation of public infrastructure. It represents the inclusion of current practices as well as proven innovation to improve consistency and maintain high-quality outcomes.	12/19/2022
24	12/2/2022 20:12	Streets (4000)-4	A new expressway along Santa Fe railway tracks to OU Campus is planned? No entry or exit for downtown? Explain where I /we get the payoff.	No new streets are proposed with this project. The focus is on the technical manuals that inform design and construction of infrastructure approved as an element of the City's capital improvement program or through the development review process.	12/19/2022
25	12/7/2022 13:41	Stormwater (5000 & 6000)-8	I'm encouraged by the inclusion of up-to date data and modeling techniques for both precipitation and topography. It's my opinion that models prescribed by current EDCs are inadequate in describing stormwater runoff, and have resulted in flooding of neighborhoods, including my own. I applaud this update.	Thank you for your feedback.	12/19/2022

	DATE	SECTION	COMMENT	RESPONSE	Uploaded Response
26	12/7/2022 13:47	Sustainable Development (7000)-2	I've read Section 7000 in some detail and applaud its inclusion in the document. As mentioned in the virtual open house meeting on 12/7, a challenge remains for the city to consider-- and agree-- on incentives supporting the various sustainable strategies and designs highlighted in the document.	Thank you for your feedback.	12/19/2022
27	12/12/2022 3:02	Streets (4000)-5	If Norman doesn't take this opportunity to narrow our lane width standards, at least on urban local streets...we are really behind. Narrower is safer! 13 feet? That is highway width! https://www.wri.org/insights/bigger-isnt-always-better-narrow-traffic-lanes-make-cities- https://www.bloomberg.com/news/articles/2015-07-28/a-new-study-finds-that-10-foot-traffic-lanes-are-safer-and-still-move-plenty-of-cars https://adleylawfirm.com/evidence-that-wider-lanes-make-city-streets-more-dangerous/	Thank you for your feedback.	1/26/2023
28	12/24/2022 18:09	Stormwater (5000 & 6000)-09	Charge same per sqft ground floor for both residential and commercial. Commercial without detention ponds pay same cost per sqft as do ground floor building. If have detention pond must prove works properly once per year. Provide public with exact sqft ground floor for all buildings and parking lot of commercial with no detention ponds. Provide total cost needed.	The EDC does not address residential or commercial permit fees.	1/26/2023
29	12/24/2022 18:10	General (1000)-09	Charge developers 100% cost for city utilities.	The EDC language represents current practice.	1/26/2023
30	12/24/2022 18:13	General (1000)-10	Developers pay 100% cost of city to provide utilities. Example. If sewer line needs to be upgraded anywhere from development to sewplant they pay all not just along city easements on the PUD.	The EDC represents current practice.	1/26/2023
31	12/30/2022 15:46	Stormwater (5000 & 6000)-10	For stormwater management, the proposal uses data from 2013. This data is a decade old! Given that climate change is driving serious disruption to historic weather patterns, why are we not incorporating future forecasting so that our storm water systems are better positioned to perform in a changing environment?	This data is the latest provided by the National Oceanographic and Atmospheric Administration and is the industry standard.	1/26/2023

**Additional Stakeholder Comments
Norman EDC Update**

Item 6.

	Section	COMMENT	RESPONSE
1	Intro	"regulate both public improvements and private work, which will either be dedicated to or accepted by the City"..."In addition all work within the public right of way is governed by these regulations." - Not bad! Good summary of the document	n/a
2		"These documents are meant to provide minimum criteria and to apply rigidly to new developments which are not constrained by already existing improvements."	n/a
3	Definitions	NOT- "that the project permitted has 70% revegetation of all bare areas and all soil disturbing activities are concluded"	Final stabilization must provide 70% or more of the cover that was provided by native vegetation prior to earth disturbance. In addition, cover must also be uniform with no large bare areas (10 square feet or greater).
		right now interpreted as restoring a site to 70% of its existing condition PRIOR to soil disturbing activities	
4		Pollutant- " Shall mean any.... Garbage, sewage sludge, chemical wastes, biological materials, radioactive materials,....rocks, sand.... Soil, sediment, building materials...	We are simply identifying a 'pollutant' as a substance that may have harmful effects on the environment.
		Are we really considering chemical waste, biological, and radioactive materials in the same category/ definition of rocks, sand, soil, and sediment?	
5		Pollution Prevention Plan- "Shall mean a written site specific plan to eliminate or reduce, and control the pollution of stormwater through designed facilities, sedimentation ponds, natural or constructed wetlands, and Best management practices.	n/a
		This is good also! Gives flexibility for site specific determinations	
6		Solid Waste- "carpet fibers, wood chips, sawdust, grass clippings, and leaves	The definition states that that solid waste is discarded material. If the wood chips are being used as a best management practice (i.e. temporary stabilization) they are not considered a discarded waste material.
7		How are wood chips considered solid waste, when mulch is considered an acceptable form of site stabilization? Ssam question for sawdust.... It's all the same material	
8		Grass clippings?	Per the city's fertilizer ordinance, grass clippings cannot be blown, swept, or otherwise disposed of in the street or stormwater drainage systems; therefore, they should be disposed of as solid waste. Grass clippings that are blown back onto the yard are serving a function as mulch and are not considered a discarded waste material.
9		Leaves? Really? Is there a plan in place to prevent the leaves from falling off the trees along creek beds each year to keep them from polluting the watersheds? Is this really a "Solid Waste"?	Per the city's fertilizer ordinance, leaves cannot be blown, swept, or disposed of in the street or stormwater drainage systems; therefore, they should be disposed of as solid waste. During FY 2022, stormwater maintenance crews removed 2,279 tons of debris from stormwater channels which included trash and debris as well as leaves, branches, and other vegetation. Debris can impede drainage causing the flow of water to back up and cause flooding.
10	Section 100- General	1001.5 - Keeping "a set of approved construction plans on the job site at all times"	An approved set of construction plans needs to be on site at all times. This is necessary for the contractors to have immediate responses to field issues using the approved plan set. This is already included in Section 1001.4 of the current EDC.
		typically these are kept at the office of the contractor and on file with the City, readily available to view upon request	
11	1002.2	"Standard sheets shall be 22" x34"	The City will use the industry standard sheet size of 24" x 36"
		this would require hand trimming of 2" off of each side of an industry standard 24"x36" plan sheet. Why?	
12	1002.19	As Built Site Grading Plan, Item B	When driveways and/or curb returns are constructed with the development, they are required to be shown on the as-builts.
		Driveway grades... requiring as built survey shots on drive way grades seems odd... no drives are poured within the right of way without prior inspection and approval by the City of Norman. Never a requirement previously.	
		Any other additional as built shots that will be a new requirement / cost for a homebuilder while constructing residences in Norman?	When driveways and/or curb returns are constructed with the development, they are required to be shown on the as-builts. This will most commonly occur with non-residential development.
13	1004.2 Proposed Site conditions	c.4.- showing retaining walls that are 3 feet higher would be better worded as "showing retaining walls that are required to be permitted"	We propose to update this statement to read "those supporting 2-foot of soil or more, measured from top of footing to top of wall."
14		c.7. "All proposed site features" this is incredibly ambiguous and open to interpretation. How can we determine "All proposed site features"?	Change 1004.2 C.7 to "Revise other significant proposed features" which is the current EDC language that represents the need to show any other significant improvements/features that are not otherwise listed above.
15		d. Requires stormwater to be drained in underground pipes if crossing more than 3 lots, above ground flumes are current standard, and are a better, less maintenance solution for both the City and contractor / property owners	This statement clarifies that overland drainage is appropriate for no more than 3 lots or 1/2 acre (whichever is less). This approach ensures consistency even with varying lot sizes. (also see 5003.6)

**Additional Stakeholder Comments
Norman EDC Update**

Item 6.

	Section	COMMENT	RESPONSE
16	1004.3 Erosion Control	" A sediment and erosion control plan shall include plans for both pre and post construction. These plans shall be prepared and submitted for review and approval by the Stormwater Program Manager or City designee"	This is not changed from the current EDC.
17		Why "PRE" construction? Are we going to shoot existing survey shots to produce these plans? Will our as builts be held to the same 70% vegetation rule when the permittee wishes to cease activity on these sites?	
18		If we are going to submit plans for "pre-construction" will a standard topo survey suffice?	Yes, a standard topographic map will suffice. The intent here is to ensure pre-construction conditions are considered when selecting, designing, and placing BMPs as significant changes in elevation may require phased sediment and erosion control plans. All construction projects wishing to terminate their permit must meet the same final stabilization requirements (70% of pre-existing vegetation).
19	1007- Retaining Wall Design	"All retaining walls 3 feet and more in height or those supporting 1 foot of soil or more shall be required to obtain a retaining wall permit prior to construction"	We propose to update this statement to read "those supporting 2-foot of soil or more, measured from top of footing to top of wall."
20		This is contradictory. Every retaining wall is in place to support soil. It would be simpler to judge a retaining wall height by elevation from footing to top of wall, which is standard on as built grading plans. The amount of fill supported by the wall is almost always directly correlated to the wall height. Removing the amount of fill language would improve this.	
21	1007.3	Retaining wall penalties - See A. and B.	This is not changed from the current EDC.
22		Is this the best way to handle this?	
23	Section 2000- Water lines	2002.4 Highlighted language "and may participate in a cost sharing of the construction"	
24		Again, ambiguous. Would be better to define what the standards are to induce City participation in cost sharing	This statement clarifies the existing process for upsizing mains. The City is responsible for making any determination related to cost sharing arrangements. Because each situation is unique, the term "may" is appropriate.
25	2002.10 Fire Hydrants	c. Seems to be missing some language - re: "if all following conditions are met: _____, " no conditions are listed	Add back missing language as follows: C. Fire hydrants may be located more than 6 ft. from the back of curb (or edge of pavement) only if the following conditions are met: 1. In no case shall the fire hydrant be located greater than 15 ft. from the back of curb (or edge of pavement). 2. A blue reflective indicator shall be placed in the center of the street at the fire hydrant.
26		h. Tamper resistant operating mechanisms only for hydrants "east of 48th Ave Ne" or as directed?	
27		Should we standardize City wide?	This is not changed from the current EDC. It is a safety issue to have open holes within the public right of way.
28	Section 4000 Streets	4001.2 - Pot Holing - Locating existing utilities	
29		e. Requiring necessary pot holing to be repaired within 24 hours doesn't seem practical, many times it will be days or weeks before the proper utility company will be able to determine what is necessary after potholing a line.	
30	4002 Traffic Impact of developments	References the need for TIA in the event a development will increase the VPH by more than 100, but also notes "each development will be evaluated based on traffic load out of the development, load on the arterial... and current planned configuration of the arterial, as shown in the City's Comprehensive Transportation Plan"	n/a
31		This document continually references the Norman 2025 Comp Plan which is in the works of being updated. Is that smart?	References to the Norman 2025 plan can be adjusted to state "the City's adopted Comprehensive Plan."
32		i.e., if we update 2025, do we need to also update the EDC so they are in line with each other?	
33	4003.2	Uses language "in the most recently adopted land use plan", in this seems to fit better and address the issue above. Would make sense to keep that language (whatever the final language is) consistent throughout the document.	
34	4007.2- Sight distance triangle	leaves the distance totally at the discretion of the director of public works. While beneficial for flexibility, leaves a lot of room for interpretation when trying to plan a project.	n/a
35	4010.4 Sidewalks	section error reference source not found!	Cross references will be checked and updated as needed

**Additional Stakeholder Comments
Norman EDC Update**

Item 6.

	Section	COMMENT	RESPONSE
36	4010.6- Curing?	list methods for concrete curing that are not typical in a day to day construction	n/a
37	4011.3	"Payment for public street signs shall be made to the City before the final plat is filed"	This will be changed to AFTER the final plat is filed
38		Typical to do this after the plat is filed.	
39	4013.1A	Lighting, General - Streetlights are not shown the preliminary plat. Streetlights are determined by the City's traffic engineer at final plat stage, and installed by franchise utility prover after plat filing	This statement will be amended. Streetlights are not required to be shown on Preliminary Plats.
40	4013.2 Scheduling	This paragraph seems to be more of an idea. Would be nice to keep the EDC to standards and guidelines.	This is not changed from the current EDC and remains applicable.
41		"A good rule to follow is to order street lighting at the same time that street name signs are ordered. Close coordination with the developer is required for lights to be installed in time to avoid interference with private landscaping"	n/a
42		Is this necessary? Is it helpful? Does street lighting ever interfere with landscaping?	n/a
43	Technical Memorandum	Designed as a companion to 7000- Sustainable Developmental Practices	n/a
44	19-411	"Allows optional section of the EDC that address sustainable stormwater development to apply broadly to the development throughout the City instead of only within the designated water quality protection zone	n/a
45		Could be extremely limiting if WQPZ requirements and regulations began to appear outside of the WQPZ zones....	Broader application of WQPZ or Section 7000 design standards is not proposed. The City may choose to explore incentives to encourage more sustainable development practices.
46	19-411.B.2	"reduction in nitrogen of at least seventy five percent (75%) and a reduction in phosphorous of at least fifty eight percent (58%)	n/a
47		How is this going to be calculated? Who does it? Who checks the method and approves it?	The calculations are defined in Section 7002.4 and will be calculated by the engineer of record. City staff will review the calculations. This is the same process that is in place with the current WQPZ.
48	19-411.F	"all developments are encouraged to utilize EDC 7000 sustainable stormwater development measures"	n/a
49	19-514	"Portions of the WQPZ that are not within 30 feet of a combustible structure may be left undisturbed and natural, and in no event, shall grassy vegetation in this area be mowed or otherwise cut down"	n/a
50	Impervious Coverage	Increasing residential impervious coverage from 65% of the lot to 85% of the lot is a GOOD thing!! We need more of this to be able to utilize smaller home sites for more affordable housing	Agree; where proper measures are taken
51		I think the issue here will be the necessary steps needed to obtain that additional 20% coverage, i.e. "capturing the 1" of rainfall... grading plans and calcs showing no adverse effect per EDC 5000"	n/a
52	Conclusion	"Adopting a program of incentives that supports sustainable stormwater development will create an environment of collaboration between the City and development community.... Proactively implementing these recommendations through ordinance amendments can ultimately reduce the long term burden on the City and it's taxpayers by mitigating the need to retrofit drainage infrastructure in the future."	n/a
53		But can it be done?	Stay tuned.
54	5000 Stormwater	see 5011.c regarding bridges in the floodway -SV	n/a
55		Detention facilities moving from 100 to 500 year with a 1' of freeboard? MO is making an objection.	We will update the reference to the 500-year floodplain to state "100-year with 1 foot of freeboard unless more stringent OWRB dam safety requirements control, as outlined in title 785:25-3-3."
56		Might need to add language about sizes, maybe acre feet for ponds, so you could downsize for smaller, and maybe upsize to larger?	Statement is unclear as to intent
57	6000 Stormwater Quality	6001.3.B enforcement language	n/a
58		6001.3.D ABATEMENT LANGUAGE, SHOULD BE SIMILAR TO THE CODE ENFORCEMENT LANGUAGE	6001.6 should be amended to "Enforcement" (remove "and Abatement")
59		this is new language that was added after stakeholder meeting, not in the current documents we have.	Proposed abatement language will not be included in this update

**Additional Stakeholder Comments
Norman EDC Update**

Item 6.

	Section	COMMENT	RESPONSE
60		6001.7 New annual permit fee of \$60 and there is additional costs for renewals. Monthly?	This is an annual fee.
61		6004.1.B Permits now going to be needed on lots less than 1 acre. Currently it's only for lots over 1 acre.	This applies to single lot development only when the site has not already been addressed through permitting for a subdivision or larger project. The City currently requires any earth disturbance that does not meet the exemptions listed in 6004.1 to obtain an earth change permit. This includes lots that may or may not be part of a common plan of development.
62		might also have specifics of ODEQ and City permitting simultaneously	n/a
63	7000 Sustainable development		
64		This section is not a requirement, but options for the city to incentivize and credit for new sustainable development	n/a
65		Potentially reducing the parkland requirement? Increasing the impervious coverage? Conservation landscaping credits	n/a
66		City is encouraging up front negotiations to help utilize credits and incentives	Agree
67		Stormwater control measures -SCMS- Encouraged, but not required	Agree
68		A lot of requirements for basin liners	n/a
69	Streets	Mainly reorganization of items, see items in green to reference the new things that came after the stakeholder meetings	n/a
70	Utilities	mainly water and sewer	n/a
71		"Eliminate the 'may' language for any oversizing of the line on case by case basis - item 2002.4 sections containing new ideas, such as non vehicular curb cuts to channel stormwater potential 85% coverage with proper stormwater controls and green development practices in place	This statement clarifies the existing process for upsizing mains. The City is responsible for making any determination related to cost sharing arrangements. Because each situation is unique, the term "may" is appropriate.
72	Development Regulations		n/a
73	General	definitions, references to adopted codes, formatting	
74		website based now. No longer individual stakeholder meetings, everything will be run through the website for comments, feedback, addressing issues, ect.	
75		Dawn will send a follow up email today with a link to the website	
76		freese.mysocialpinpoint.com/normanedcupdate/home	n/a
77		click the get involved tab to get to the screen for feedback	
78		use the ideas wall for anything edc specific	
79		use the contact us for items that are not EDC specific	
80	Discussion	Is fee in lieu of detention still available?	Yes, in approved situations; no change is proposed to the City's current fee in lieu consideration/process.
81		still allowable on a case by case basis, but wil require Council approval	Agree
82		Maybe add a map of areas that would be reasonable to utilize fee in lieu of detention within the EDC update? EDC has to be approved by council	A map could exclude consideration of an area. Recommend having open discussions with staff during development of project.
83		Mo- definition- depth of cover over the pipe should be to the top of the pipe, Terry confirmed and all agreed	Yes, that is correct. This definition will be updated to state "Pipe depth or depth of cover shall mean the difference between the finished grade elevation and the top of the pipe."
84		1002.2- Why are we going to 34x22?	This reference will be updated to reflect 24"x36" standard sheets.
85		Significant amount of time required to review this. How much time do you we have to ask questions?	
86		Council wants this in front of them for action by the end of 2022 - Second or third week of December is what Council requested -Dawns answer	
87		When is the odd seat election? January? Why are we rushing?	At the 11/29/22 study session, the City Council extended the project timeline providing additional review time. The EDC is scheduled for consideration by the City Council on 2/14/23.
88		Last week of October is the open house with the public, so essentially we need to get comfy with everything before the end of October when it released to the public.	
89		Roach- feels like the timeline is rushed, and we should make sure we take the time necessary to make sure the final product is a good solution for all parties.	

**Additional Stakeholder Comments
Norman EDC Update**

Item 6.

	Section	COMMENT	RESPONSE
90		Presentation from today will be uploaded to the website.	n/a
91	General	1002.2- requires standard sheet size to be 22"x34xx. Currently the standard sheet size is 24"x36" and this is the size required in all other municipalities in this area. While we realize that this new size is to facilitate the printing of half size sheet sets on 11" x 17" paper, we are concerned that this will cause issues in the printing of full size plans. Most plotters are designed to handle a 36" wide roll of paper. Plotting out a 34" sheet on a 36" wide roll of paper will require that each sheet that is plotted will then have to be trimmed by hand down to 34". This will cause an egregious amount of extra work on large sets of plans causing a major waste of time and money.	This reference will be updated to reflect 24"x36" standard sheets.
92		1002.19B - requires that driveway grades be placed As-Built Grading Plans. But when this plan is prepared, not only has the driveway now been constructed, but neither has the finished floor of the home. Any grade placed on the plan would be a complete fabrication. This is just extra work that would have no real meaning.	When driveways and/or curb returns are constructed with the development, they are required to be shown on the as-builts.
93		1004.2D - requires for an underground storm sewer if stormwater runoff from more than 3 lots of 1/2 acre drains onto another lot or between 2 lots. In the past, we have been allowed to accommodate this with a flume and we would like to maintain this as an option.	This statement clarifies that overland drainage is appropriate for no more than 3 lots or 1/2 acre (whichever is less). This approach ensures consistency even with varying lot sizes. (also see 5003.6)
94		1007.1- requires a permit for retaining walls that are "3 feet and more in height or those supporting 1 foot of soil or more". We are not sure how to interpret this.	We propose to update this statement to read "those supporting 2-foot of soil or more, measured from top of footing to top of wall. "
95	Water Lines	2002.4- states that "The additional cost for the upsize shall be determined by the Utilities Engineer and may participate in a cost sharing of the construction." This statement is not clear. We believe if upsizing of the waterline is required by the City then they should absolutely participate in cost sharing.	This statement clarifies the existing process for upsizing mains. The City is responsible for making any determination related to cost sharing arrangements. Because each situation is unique, the term "may" is appropriate.
96	Sanitary Sewer	3002.7 - set a maximum depth of sanitary sewer lines at 12 feet unless approved by the Utilities Engineer. In the past, the maximum depth was 20 feet. And in Oklahoma City it is 18 feet. While we usually design the lines to be as shallow as possible, there are times when a 12 feet maximum depth could be severely restrictive.	This is not changed from the current EDC and staff feels that approval of the Utility Engineer is appropriate.
97	Streets	4004.4 A&B - have to do with profile requirements on plans sheets. But the statements are really confusing and not clear as to what is required. Needs to be explained better and examples given.	This is not changed from the current EDC.
98		4010.4- contains a statement that says "Section Error! Reference source not found." This needs to be cleaned up	Cross references will be checked and updated as needed
99		4013.1A - requires that streetlights be shown on the preliminary plat. But this information is provided by the franchised vendor providing electrical service, and they do not get involved until the project is almost under construction.	This statement will be amended. Streetlights are not required to be shown on Preliminary Plats.
100	Stormwater	5003.6- has the same issue as 1004.2 D above	This statement clarifies that overland drainage is appropriate for no more than 3 lots or 1/2 acre (whichever is less). This approach ensures consistency even with varying lot sizes.
101		5005.4- has to do with the required use of the soil conservation services (SCS) method to size detention ponds. This will cause the ponds to be much larger in size, even for smaller developments. This will take up more land. This method is good for 200 acres or later size parcels, but is not suitable for small parcels.	This language will be clarified regarding stabilization zones for wet ponds.
102		5006.1 B & C are more restrictive than the past and will result in additional inlets needed to meet these requirements.	
103		5007.2.3 - Does not agree with 5006.1 C on the depth of flow allowed in residential streets	Remove "(typically 0.38') from 5007.2.3; criteria in 5006.1.C addresses depth of street flow for all street types.
104		5007.2 B 3- requires that at least 70 percent of the street flow must be captured by the curb inlets. This means that either the slope of the street will have to be flatter, the inlets will have to be larger, or the inlets will have to be spaced more frequently (more inlets)	The current EDC state 70 to 80% capture in Section 5007.1.D.2. This recommendation is on the lower end of the current EDC requirements.

**Additional Stakeholder Comments
Norman EDC Update**

Item 6.

	Section	COMMENT	RESPONSE
105		5012.2.O- requiring OWRB guidelines for hazard dams to regulate small detention ponds will also result in larger detention ponds which take up more land	This statement is in the current EDC in Section 5011.2.S and it has been applied in the past. This section only states that OWRB dam safety criteria shall be used. It does state that all dams must meet high design hazard criteria.
106		5012.2.Q- Including the 500 year storm event analysis into sizing the outlet of the detention pond will also increase the size of the pond and use more land	We will update the reference to the 500-year floodplain to state "100-year with 1 foot of freeboard unless more stringent OWRB dam safety requirements control, as outlined in title 785:25-3-3."
107		5012.4A - says the fee-in-lieu of detention is allowed at the discretion of the City Engineer. But in a meeting held with City staff after the release of this draft version of the EDC, we were told that fee-in-lieu of detention was going to be discouraged and would have to be approved by the City Council. We believe that fee-in-lieu of detention is a good tool if applied correctly.	Agree; no changes to this program are proposed. Fee-in-lieu may be considered when appropriate; a recommendation from the City Engineer and city council approval are required.
108	Stormwater Quality	6004.2 G - Need to define stabilization as above water level. Bottoms of sedimentation basins that are also ponds cannot be stabilized if they are wet.	This language will be clarified regarding stabilization zones for wet ponds.
109	Sustainable Stormwater Development	We generally believe that many of the items in this section, if they become a requirement and not an option, will create increased costs to the developers due to higher reporting requirements and lots of mandatory certification by professionals.	Section 7000 is proposed as an optional part of the EDC which can support development within the WQPZ and may otherwise be utilized at the discretion of the applicant/developer. The City Council may choose to broaden application of Section 7000 at a later time.
110		7004.3C - Integrated pest management for ponds will increase maintenance costs.	This is a possible outcome; however pest management is necessary to address best practices for health and safety.
111		7004.3 C 2 c - only one species of fish is allowed to be introduced into the wet pond to control mosquitoes	The required fish species criteria are stated in section 7004.3; additionally, the City will accept the introduction of species as recommended by the OK Department of Wildlife Conservation.
All comments were reviewed by staff and the consultant team			
n/a	Indicates the comment is a statement, not a question		

File Attachments for Item:

7. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF ORDINANCE O-2223-25 UPON FIRST READING BY TITLE:
AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 8-503 OF THE CODE OF ORDINANCES CONTINGENT ON VOTER APPROVAL OF ORDINANCE O-2223-26 TO INCREASE THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS; PROVIDING FOR AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Dan Schemm, Visit Norman Executive Director

PRESENTER: Kathryn Walker, City Attorney

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF ORDINANCE O-2223-25 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 8-503 OF THE CODE OF ORDINANCES CONTINGENT ON VOTER APPROVAL OF ORDINANCE O-2223-26 TO INCREASE THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS; PROVIDING FOR AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.

BACKGROUND:

The voters of Norman first approved the Transient Guest Room Tax of four percent (4%) in 1980 for the explicit purpose of “encouraging, promoting, and fostering the convention and tourism development within the City of Norman...Uses in park development and in promotion of arts and humanities are thus contemplated”. The tax has been increased one time – by 1% - since 1980. The revenues from the Guest Room Tax are currently split between the Norman Convention and Visitors Bureau d/b/a VisitNorman (50%), the Norman Arts Council (25%), and the Norman Parks and Recreation Department (25%) after three percent (3%) is retained for administration of the tax. These allocations are set forth in contracts with VisitNorman and Norman Arts Council and not in the Ordinance.

DISCUSSION:

Dan Schemm, Executive Director of VisitNorman, presented a proposal for an increase in the Guest Room Tax to Council on January 24, 2023. The proposal is to increase the tax to 8%, and split the additional three percent between VisitNorman and the Norman Arts Council. The new funding generated by the increased tax revenue and allocated to VisitNorman is for the purpose of supporting a proposed Sports Commission that would market Norman’s sports tourism opportunities. The Commission would also help create special events, enhance venues, and engage potential partners local and nationally. If the tax measure is successful, amendments to the contracts with VisitNorman and Norman Arts Council will be necessary. Council directed Staff to prepare ordinances for a May election.

Ordinance O-2223-25 would amend Section 8-503 of the current Norman City Code to increase the tax rate from 5% to 8%. As this Ordinance is being considered prior to the effective date of Ordinance O-2223-24, recodifying the City Code in its entirety, it is an amendment to current Section 8-503.

Ordinance O-2223-25 calls a special election on May 9, 2023. If successful, the new rate would go into effect on July 1, 2023. Additionally, the code amendment will be placed in Section 12-502 of the newly recodified code (assuming Ordinance O-2223-23 is adopted).

RECOMMENDATION:

Per Council's direction, Staff forwards Ordinance O-2223-25 and O-2223-26 to Council for adoption upon First, Second and Final Reading.

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA AMENDING SECTION 8-503 OF THE CODE OF ORDINANCES OF THE CITY OF NORMAN, OKLAHOMA CONTINGENT ON VOTER APPROVAL OF ORDINANCE NO. O-2223-26 TO INCREASE THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS; PROVIDING FOR AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.

- § 1. WHEREAS, the Norman Transient Guest Room Tax Ordinance (Ordinance No. O-7980-58) was originally adopted in May 1980 with the citizens of Norman voting to enact the corresponding excise tax of four percent (4%) in July 1980; and
- § 2. WHEREAS, the excise tax has been increased once since its original adoption when it was increased from four percent (4%) to five percent (5%) in 2013; and
- § 3. WHEREAS, excise tax funds collected through this tax are set aside and used exclusively for the purpose of encouraging, promoting and fostering the convention and tourism development of the City of Norman; and
- § 4. WHEREAS, an increase in the excise tax would provide funding to promote and foster the tourism development in the City of Norman resulting from recent improvements to sports facilities and would provide additional opportunities for public art.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 5. That should the voters approve the excise tax increase set out in Ordinance No. O-2223-26, then Section 8-503 of Chapter 8 of the Code of the City of Norman, Oklahoma, which will ultimately be recodified as Section 12-502 upon the effective date of Ordinance O-2223-24, shall be and is hereby amended to read as follows:

Sec. 8-503. Tax Rate.

There is hereby levied an excise tax of Eight percent (8 %) upon the gross proceeds or gross receipts derived from all rent for every occupancy of a room or rooms in a hotel in this City except that the tax shall not be imposed where the rent is less than the rate of Three Dollars (\$3.00) per day.

- § 6. Effective Date. The rates described above shall be effective for all occupancy billings issued on or after the 1st day of July, 2023, and thereafter conditioned upon said rate increase being approved by a majority of the registered voters voting in an election called for the purpose of approving or rejecting said rates; Said election to be held on

the 9th day of May, 2023.

§ 7. **Severability.** If any section, subsection, sentence, clause, phrase or portion of this ordinance is for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision and such holding shall not affect the validity of the remaining portions of this ordinance, except, that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this _____ day

NOT ADOPTED this _____

day

of _____, 2023.

Of _____, 2023.

Mayor

Mayor

ATTEST:

City Clerk

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA AMENDING SECTION 8-503 OF THE CODE OF ORDINANCES OF THE CITY OF NORMAN, OKLAHOMA CONTINGENT ON VOTER APPROVAL OF ORDINANCE NO. O-2223-26 TO INCREASE THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS; PROVIDING FOR AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.

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- § 2. WHEREAS, the excise tax has been increased once since its original adoption when it was increased from four percent (4%) to five percent (5%) in 2013; and
- § 3. WHEREAS, excise tax funds collected through this tax are set aside and used exclusively for the purpose of encouraging, promoting and fostering the convention and tourism development of the City of Norman; and
- § 4. WHEREAS, an increase in the excise tax would provide funding to promote and foster the tourism development in the City of Norman resulting from recent improvements to sports facilities and would provide additional opportunities for public art.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 5. That should the voters approve the excise tax increase set out in Ordinance No. O-2223-26, then Section 8-503 of Chapter 8 of the Code of the City of Norman, Oklahoma, which will ultimately be recodified as Section 12-502 upon the effective date of Ordinance O-2223-24, shall be and is hereby amended to read as follows:

Sec. 8-503. Tax Rate.

There is hereby levied an excise tax of ~~Five~~ Eight percent (~~5~~ 8 %) upon the gross proceeds or gross receipts derived from all rent for every occupancy of a room or rooms in a hotel in this City except that the tax shall not be imposed where the rent is less than the rate of Three Dollars (\$3.00) per day.

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the 9th day of May, 2023.

§ 7. **Severability.** If any section, subsection, sentence, clause, phrase or portion of this ordinance is for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct and independent provision and such holding shall not affect the validity of the remaining portions of this ordinance, except, that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this _____ day

NOT ADOPTED this _____

day

of _____, 2023.

Of _____, 2023.

Mayor

Mayor

ATTEST:

City Clerk

File Attachments for Item:

8. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF ORDINANCE O-2223-26 UPON FIRST READING BY TITLE:
AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AUTHORIZING THE CALLING AND HOLDING OF A SPECIAL ELECTION IN SAID CITY OF NORMAN, STATE OF OKLAHOMA, (THE CITY), ON THE NINTH DAY OF MAY, 2023, FOR THE PURPOSE OF SUBMITTING TO THE REGISTERED, QUALIFIED ELECTORS OF SAID CITY THE QUESTION OF APPROVING OR REJECTING ORDINANCE O-2223-25, WHICH ORDINANCE AMENDS SECTION 8-503 OF CHAPTER 8 OF THE CODE OF ORDINANCES OF THE CITY OF NORMAN, OKLAHOMA, BY INCREASING THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS BY THREE PERCENT (3%) TO A TOTAL OF EIGHT PERCENT (8%); PROVIDING AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Dan Schemm, Visit Norman Executive Director

PRESENTER: Kathryn Walker, City Attorney

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT AND/OR POSTPONEMENT OF ORDINANCE O-2223-26 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AUTHORIZING THE CALLING AND HOLDING OF A SPECIAL ELECTION IN SAID CITY OF NORMAN, STATE OF OKLAHOMA, (THE CITY), ON THE NINTH DAY OF MAY, 2023, FOR THE PURPOSE OF SUBMITTING TO THE REGISTERED, QUALIFIED ELECTORS OF SAID CITY THE QUESTION OF APPROVING OR REJECTING ORDINANCE O-2223-25, WHICH ORDINANCE AMENDS SECTION 8-503 OF CHAPTER 8 OF THE CODE OF ORDINANCES OF THE CITY OF NORMAN, OKLAHOMA, BY INCREASING THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS BY THREE PERCENT (3%) TO A TOTAL OF EIGHT PERCENT (8%); PROVIDING AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.

BACKGROUND:

The voters of Norman first approved the Transient Guest Room Tax of four percent (4%) in 1980 for the explicit purpose of “encouraging, promoting, and fostering the convention and tourism development within the City of Norman...Uses in park development and in promotion of arts and humanities are thus contemplated”. The tax has been increased one time – by 1% (to a total of 5%) - since 1980. The revenues from the Guest Room Tax are currently split between the Norman Convention and Visitors Bureau d/b/a VisitNorman (50%); the Norman Arts Council (25%); and the Norman Parks and Recreation Department (25%), after three percent (3%) is retained by the City’s General Fund for administration of the tax. These allocations are set forth in contracts with VisitNorman and Norman Arts Council and are not in the ordinance.

DISCUSSION:

Dan Schemm, Executive Director of VisitNorman, presented a proposal for an increase in the Guest Room Tax to Council on January 24, 2023. The proposal is to increase the tax to a total of 8%, and split the additional three percent between VisitNorman and the Norman Arts Council.

The new funding generated by the increased tax revenue and allocated to VisitNorman is for the purpose of supporting a proposed Sports Commission that would market Norman's sports tourism opportunities. The Commission would also help create special events, enhance venues, and engage potential partners locally and nationally. If the tax measure is successful, contract amendments to the contracts with VisitNorman and Norman Arts Council will be necessary. Council directed Staff to prepare ordinances for a May voter referendum on the proposed tax increase.

Ordinance O-2223-25 would amend Section 8-503 of the current Norman City Code to increase the tax rate from 5% to 8%. As this Ordinance is being adopted prior to the effective date of Ordinance O-2223-24, recodifying the City Code in its entirety, it is an amendment to the current Section 8-503; the numbering of the relevant Code section may be subject to change.

Ordinance O-2223-25 calls a special election on May 9, 2023. If successful, the new rate would go into effect on July 1, 2023. Additionally, the code amendment will be placed in Section 12-502 of the newly recodified code (assuming Ordinance O-2223-23 is adopted).

RECOMMENDATION:

Per Council's direction, Staff forwards Ordinance O-2223-25 and O-2223-26 to Council for adoption upon First, Second and Final Reading.

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AUTHORIZING THE CALLING AND HOLDING OF A SPECIAL ELECTION IN SAID CITY OF NORMAN, STATE OF OKLAHOMA, (THE CITY), ON THE NINTH DAY OF MAY, 2023, FOR THE PURPOSE OF SUBMITTING TO THE REGISTERED, QUALIFIED ELECTORS OF SAID CITY THE QUESTION OF APPROVING OR REJECTING ORDINANCE NO. O-2223-25, WHICH ORDINANCE AMENDS SECTION 8-503 OF CHAPTER 8 OF THE CODE OF ORDINANCES OF THE CITY OF NORMAN, OKLAHOMA, BY INCREASING THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS BY THREE PERCENT (3%) TO A TOTAL OF EIGHT PERCENT (8%); PROVIDING AN EFFECTIVE DATE FOR SAID INCREASE SUBJECT TO VOTER APPROVAL; AND PROVIDING FOR THE SEVERABILITY THEREOF.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 1. Proposition. That the Mayor of the City of Norman, Oklahoma, or in his absence or incapacity, the duly qualified Mayor Pro Tem, be and hereby is authorized and directed to call a special election to be held in the City of Norman, Oklahoma, on the 9^h day of May, 2023 for the purpose of submitting to the registered, qualified voters of said City of Norman, Oklahoma, for their approval or rejection the following propositions:

PROPOSITION I

SHALL ORDINANCE NO. O-2223-25 OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, INCREASING THE EXCISE TAX UPON THE GROSS PROCEEDS OR GROSS RECEIPTS DERIVED FROM RENTS RECEIVED FROM OCCUPANCY OF HOTEL ROOMS BY THREE PERCENT (3%) TO A TOTAL OF EIGHT PERCENT (8%) EFFECTIVE ON JULY 1, 2023 BE APPROVED?

- § 2. That such call for said election shall be by Special Election Proclamation and Notice, signed by the Mayor or Mayor Pro Tem and attested to by the City Clerk, setting forth the proposition to be voted on; that the ballots set forth in the proposition be voted upon substantially as set out in Section 1 hereof; and that the returns of said election shall be made to and canvassed by the Cleveland County Election Board.
- § 3. That the number and location of the polling places and the persons who conduct the elections shall be the same as the regular polling places and persons prescribed and selected by the Cleveland County Election Board for elections in the City of Norman, Oklahoma.

- § 4. That the Special Election Proclamation and Notice of even date, a copy of which is on file with the City Clerk and which is incorporated herein by reference, calling such special election is hereby approved in all respects, and that the Mayor or Mayor Pro Tem is hereby authorized to execute said special election proclamation on behalf of the City, and the City Clerk is hereby authorized to attest and affix the seal of said City to said Special Election Proclamation and Notice and cause a copy of said Special Election Proclamation and Notice to be published as required by law, and a copy thereof delivered to the Cleveland County Election Board.
- § 5. That the City Clerk shall serve or cause to be served, a copy of this Ordinance and a copy of the Special Election Proclamation and Notice of Election upon the office of the Cleveland County Election Board, not less than sixty (60) days prior to the date of the election.

ADOPTED this _____ day of
_____, 2023.

NOT ADOPTED this _____ day of
_____, 2023.

Mayor

Mayor

ATTEST:

City Clerk

File Attachments for Item:

9. CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE CITY MANAGER'S CONTRACT AND CHANGE ORDER REPORT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Brenda Hall, City Clerk

PRESENTER: Brenda Hall, City Clerk

ITEM TITLE: CONSIDERATION OF ACKNOWLEDGEMENT, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE CITY MANAGER'S CONTRACT AND CHANGE ORDER REPORT.



office memorandum

DATE: January 26, 2023

TO: Darrel Pyle, City Manager

FROM: Anthony Purinton, Assistant City Attorney *AP*

THROUGH: Kathryn Walker, City Attorney *KW*

SUBJECT: Imhoff and Oakhurst Affordable Housing Project Phase I
Environmental Inspection Contract

City Council approved a purchase and sale agreement for property located on the NE Corner of Imhoff and Oakhurst on 1/24/23. Attached is a vendor agreement for an environmental inspection services (K-2223-115). The price of the inspection service is \$2,150.00. City Staff recommends approval of the contract so that the City can begin due diligence inspections as soon as possible. If approved, please sign and return so that we can provide the vendor with notice to proceed. Let me know if you have any questions or concerns.

Redbud Environmental LLC
2124 Dakota Street
Norman, OK 73069
405-255-8677
Daphne@RedbudEnvironmental.com

**Engagement of Services Agreement for Imhoff Road Development
Land Cleveland County Parcel ID: NC29 8 2W 4046**

This letter engages Redbud Environmental, LLC to perform a **Phase One Environmental Site Assessment** for the property listed above. The report will be performed in accordance with the American Society for Testing and Materials (ASTM) most current standard E-1527-21 All Appropriate Inquiry and will provide the client with a technical summary and supporting data regarding recognized environmental conditions. The Phase One report will meet SBA requirements and contain maps, photographs, land use documentation, regulatory compliance issues, interviews, and other items of due diligence. The objective of the report is to provide CERCLA liability protection to the buyer and lender. Additional environmental or real estate conditions which may adversely affect the use of the property will be reviewed including oil and gas activities. The environmental consultant meets ASTM criteria for doing the Phase One reports and carries \$1,000,000 of professional liability insurance with Traveler's insurance company.

The cost for the Phase One report will be \$2,150.00 payable at the time of report delivery. No testing will be conducted unless specified by the client. The Phase One report will be submitted electronically within 15 working days.

I acknowledge and agree by my signature below to engage Redbud Environmental, LLC under the terms described above to conduct a Phase one report for the property listed.

Darrel Pyle City Manager
Client Clearly Printed Name Title
[Signature] 1-26-23
Client Signature Date

THE FOLLOWING INFORMATION IS REQUIRED TO PROCEED:

- If available, please provide appraisals or historical appraisals and historical Phase I/Phase II reports or other environmental reports.
- How should the report be titled (Name, Title, and Mailing Address)?

For questions please contact: **Daphne Summers at 405-255-8677**

Please send the signed Engagement Letter to: Daphne@RedbudEnvironmental.com

USER QUESTIONNAIRE
ASTM E 1527 – 21 for
Imhoff Road Development Land Cleveland County Parcel ID: NC29 8 2W 4046

INTRODUCTION

In order to qualify for one of the *Landowner Liability Protections (LLPS)* offered by the Small Business Liability Relief and Brownfields Revitalization Act of 2001 (the "Brownfields Amendments"), the user must conduct the following inquiries required by 40 C.F.R. §§ 312.25, 312.28, 312.29, 312.30, and 312.31. the user should provide the following information to the environmental professional. Failure to conduct these inquiries could result in a determination that "all appropriate inquiry" is not complete.

1. Environmental cleanup liens that are filed or recorded against the Subject Property (40 CFR 312.25).

Did a search of land title records (or judicial records where appropriate, see Note 1 below) identify any environmental liens filed or recorded against the Subject Property under federal, tribal, state, or local law? (Note 1: in certain jurisdictions, federal, tribal, state, or local statutes or regulations specify that environmental liens and AULs be filed in judicial records rather than in land title records. In such cases, judicial records shall be searched for environmental liens and AULs).

_____ Yes _____ No If yes, please describe and provide records to the environmental professional

Title Work is in progress, will update
2. Activity and land use limitations (AULs) that are in place on the Subject Property or that have been filed or recorded against the Subject Property.

Did a search of land title records (or judicial records per Note 1 above) identify any AULs, such as engineering controls, land use restrictions, or institutional controls that are in place at the Subject Property and/or have been filed or recorded against the Subject Property under federal, tribal, state, or local law?

_____ Yes _____ No If yes, please describe and provide records to the environmental professional

Title work in progress, will update
3. Specialized knowledge or experience of the person seeking to qualify for the Landowner Liability Protections (40 CFR 312.28).

Do you have any specialized knowledge or experience related to the Subject Property or nearby properties? For example, are you in the same line of business as the current or former occupants of the Subject Property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business _____ Yes ☒ No If yes, please describe (use additional sheets as needed)

4. Relationship of the purchase price to the fair market value of the Subject Property if it were not contaminated (40 CFR 312.29).

Does the purchase price being paid for the Subject Property reasonably reflect the fair market value of the property?

☒ Yes _____ No

If you conclude that there is a difference, have you considered whether the lower purchase price is because contamination is known or believed to be present at the property? _____ Yes ☒ No If yes, please describe (use additional sheets as needed)

5. Commonly known or reasonably ascertainable information about the Subject Property (40 CFR 312.30).

Are you aware of commonly known or reasonably ascertainable information about the Subject Property that would help the environmental professional to identify conditions indicative of releases or threatened releases? For Example,

- Do you know the past uses of the Subject Property?
- Do you know of specific chemicals that are present or once were present at the Subject Property?
- Do you know of spills or other chemical releases that have taken place at the Subject Property?
- Do you know of any environmental cleanups that have taken place at the Subject Property?
- If you answered yes above, please describe. Use additional sheets as necessary.

No
6. The degree of obviousness of the presence of likely presence of contamination at the Subject Property, and the ability to detect the contamination by appropriate investigation (40 CFR 312.31).

Based on your knowledge and experience related to the Subject Property, are there any obvious indicators that point to the presence of likely presence of releases to the Subject Property? _____ Yes ☒ No If yes, please describe (use additional sheets as needed)

Prepared by (Print and sign):

Anthony Purinton

Date: *1/26/23*

File Attachments for Item:

10. CONSIDERATION OF ACKNOWLEDGEMENT, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE NORMAN CONVENTION AND VISITORS BUREAU, INC., (VISIT/NORMAN) ANNUAL REPORT FROM JUNE 30, 2021, THROUGH JUNE 30, 2022.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Brenda Hall

PRESENTER: Brenda Hall, City Clerk

ITEM TITLE: CONSIDERATION OF ACKNOWLEDGEMENT, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF THE NORMAN CONVENTION AND VISITORS BUREAU, INC., (VISIT/NORMAN) ANNUAL REPORT FROM JUNE 30, 2021, THROUGH JUNE 30, 2022.

VISIT NORMAN

Item 10.

FISCAL YEAR 2022

ANNUAL REPORT

JULY 1, 2021-JUNE 30, 2022

Fiscal Year 2022 VisitNorman Executive Board

Chair: Amish Zaver
Vice Chair: James Howard
Treasurer: Scott Kovalick
Past Chair: Kyle Allison

Fiscal Year 2022 VisitNorman Board of Directors

Amber Beutler	Emily Chancellor
Carol Dillingham	Caitlin Fournier
Steve Gillis	Angel Green
Helen Green	Jerry Hatter
Mandy Haws	Amy Million
	Wes Moody

Fiscal Year 2022 VisitNorman Ex-Officio Members

Brenda Hall, City of Norman
Lee Hall, Norman City Council Member
Lawrence McKinney, Norman Economic Development Coalition
Scott Martin, Norman Chamber of Commerce



Fiscal Year 2022 VisitNorman Staff

Dan Schemm
Executive Director

Trent Brown
Sales Manager & videographer

Taylor Mauldin Wagner
Sales & Special Event Manager

Stefanie Brickman
Communications Manager

Ryan Smith
Digital Media Coordinator

The VisitNorman Fiscal Year 2021 Annual report details the time period of July 1, 2021 through June 30, 2022.

The year 2020 will forever be remembered as the year the world shut down. Although VisitNorman was 75 percent of way through FY20, FY21 was when the hotel/motel tax's decrease was most reflectively shown in the annual report. Last year, we reported marked decreases in virtually every key performance indicator.

However, thanks to the CARES grant provided by the City of Norman to VisitNorman, VisitNorman was able to stay afloat in FY21 and share marked increases during FY22. The five largest KPI percentages of more than 50 percent included:

- Instagram reach (97 percent)
- Earned media impressions (83 percent)
- Facebook reach (63 percent)
- Number of booked room nights (55 percent)
- Advertising equivalency (52 percent)

Other KPIs with more than 30-percent growth included:

- User sessions on VisitNorman.com
- Unique users to VisitNorman.com
- Page views on VisitNorman.com
- Distributed visitor guides
- Qualified leads sent to partners
- Estimated room nights sent to partners
- Groups serviced

The highlight of the year was receiving the highest honor at the Oklahoma Travel Industry Association's Redbud Awards dinner in June when VisitNorman was named as the Tourism Organization of the Year Large Budget winner for the very first time. Being able to receive the CARES grant from Norman City Council allowed VisitNorman to take those dollars and not only sustain ourselves but to be able to market Norman throughout the region.

One trend that solidified during the pandemic continues to hold true. Youth sports is not only recession proof but also pandemic proof. Norman stands to capitalize on this opportunity with the completion of the Norman Forward facilities, including the Young Family Athletic Center and the Griffin Park soccer enhancements. Additionally, the move to the SEC will only enhance Norman's reputation as a sports community. We will have the chance to welcome a whole new crop of first-time visitors to Norman as they travel to the mecca of college football, softball and gymnastics. VisitNorman is ready to roll out the welcome mat.

Dan Schemm
VisitNorman Executive Director

VISIT NORMAN

Item 10.

FISCAL YEAR 2022

ANNUAL REPORT

JULY 1, 2021-JUNE 30, 2022

	12 months ending Fiscal Year 2018	12 months ending Fiscal Year 2019	12 months ending Fiscal Year 2020	12 months ending Fiscal Year 2021	12 months ending Fiscal Year 2022
<i>Leisure Travel Advertisement & Communication</i>					
Number of programs	350	345	181	280	238
Number of gross impressions	72,920,904	68,907,532	12,261,916	15,285,076	21,358,921
Visitor Guides distributed	24,028	16,352	13,047	7,136	11,523
Unique visits to VisitNorman.com	86,906	108,113	137,350	116,729	174,809
<i>Leisure Travel Media Relations</i>					
Media Placements	789	804	598	319	438
Number of impressions	698,893,438	422,643,673	218,006,287	65,345,302	385,644,952
Advertising equivalency	\$502,874.71	\$2,765,457.65	\$4,213,218.10	\$699,478.67	\$1,452,068.02
<i>Convention/Sports Performance Measures</i>					
Number of Qualified Leads	67	104	82	25	48
Number of potential room nights	31,663	58,093	29,217	8,395	15,517
Number of bookings	26	33	15	12	14
Booked room nights	16,668	17,222	10,064	5,075	11,364
Number of groups serviced	53	30	22	8	16
<i>Visitor Volume Measures</i>					
Bureau expenditures	\$861,233.65	\$923,661.64	\$896,007.42	\$491,833.41	\$991,115.68
Occupancy of hotels, motels & B&Bs	62.30%	63.50%	47.44%	47.04%	58.33%
Average daily rate	\$85.93	\$86.75	\$80.29	\$77.39	\$97.79
Transient Guest Tax collection	\$1.87 million	\$1.88 million	\$1.42 million	\$1.1 million	\$1.74 million
Sales tax collection	\$73.54 million	\$74.84 million	\$73.84 million	\$59.7 million	\$71.6 million

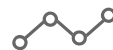
¹ Number of properties included in the report did not remain constant in FY21 for an exact equal comparison

FY22 ANNUAL REPORT BY THE NUMBERS

\$165 million
Travel spending in Norman

\$6.2 million
Local tax revenue from tourism

2,800
Tourism Industry Employees in Norman



KEY PERFORMANCE INDICATOR INCREASES

Increase in the number of booked nights sent to partners

55.3%

Increase in the number of Qualified Leads sent to partners

47.9%

Increase in the amount of estimated nights sent to partners

45.8%

97%

Increase in Instagram reach

83%

Increase in number of earned media impressions

File Attachments for Item:

11. CONSIDERATION OF AUTHORIZATION, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT FOR THE PURCHASE OF THREE (3) SIDE LOAD SANITATION VEHICLES FROM J&R EQUIPMENT AND RUSH TRUCK CENTER IN THE AMOUNT OF \$1,560,000 UTILIZING OKLAHOMA STATE CONTRACT NUMBERS SW197 AND SW0035T, RESPECTIVELY, AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Bret Scovill, Solid Waste Manager

PRESENTER: Bret Scovill, Solid Waste Manager

ITEM TITLE: CONSIDERATION OF AUTHORIZATION, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT FOR THE PURCHASE OF THREE (3) SIDE LOAD SANITATION VEHICLES FROM J&R EQUIPMENT AND RUSH TRUCK CENTER IN THE AMOUNT OF \$1,560,000 UTILIZING OKLAHOMA STATE CONTRACT NUMBERS SW197 AND SW0035T, RESPECTIVELY, AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.

BACKGROUND:

The City of Norman provides residential solid waste services to over 46,000 customers using side load trucks. This service is required weekly to maintain the level of service required for our customers and to maintain local health standards.

Recently, the purchases of fleet vehicles have been made more difficult due to the lack of production in the truck industry and long lead times due to insufficient supply. The standard fleet solid waste collection vehicle for the City of Norman is currently 18 to 24 months from issuance of the purchase order to delivery. As an example of this impact, vehicles budgeted for fiscal year 2020-2021 (FYE 2021) are still pending due to insufficient supply.

DISCUSSION:

Fleet Maintenance was notified that there is an opportunity to have a limited number of trucks delivered in as little as 13 months from two companies on state contract. The chassis and body for these trucks are from Rush Truck Center (state contract SW0035T) for a cost of \$614,130. This company currently has three trucks in line to be built in their plant in June of this year that another municipality had ordered and then cancelled the order. J&R (state contract SW197) has the Labrie ASL body for these trucks that will be installed in Canada 180 days after delivery for a cost of \$914,580. In order to continue reliable and resilient solid waste collection and reduce maintenance costs, the Sanitation Division proposes to proactively purchase these vehicles immediately for delivery by June 2024.

Three side load trucks are proposed for purchase to maintain a resilient level of service and fleet integrity in light of current market trends. Funds in the amount of \$1,560,000 are requested to be appropriated from the Sanitation Fund Balance into Residential Collection Heavy Duty

Vehicles (account 33955161-45008). Upon appropriation, staff will execute a purchase order immediately in accordance with City purchasing requirements and policies.

RECOMMENDATION:

Staff recommends the appropriation of funds in the amount of \$1,560,000 from the Sanitation Fund Balance (account 33-29000) into Residential Collection Heavy Duty Vehicles (account 33955161-45008) for the purchase of three side load trucks and approval for staff to purchase vehicles upon appropriation in accordance with City purchasing requirements and policies.

Client: J & R Equipment LLC
Contact: Rodney Womack
Address: 8800 SW 8th Street
Oklahoma City, OK, 73128, USA
Phone/Fax: 405-495-5110 / 405-495-5112
Distributor: J & R Equipment Co.

User: Norman OK, City of - AUAH (18368 rev1)
Contact: Mike White
Address: 1301, Da Vinci Street
Norman, OK 73069
Phone/Fax: 405-292-9708 /
Price List:

Shipping address if different from above: **J & R in Oklahoma City, OK**

Chassis delivery : Canada: 175-B route Marie-Victorin, Lévis, QC, Canada G7A 2T3

DESCRIPTION				Price
Model:	AUTOMIZER HELPING HAND		Capacity:	24 (20+4) c.y. - YHHS0204
Chassis MFR:	Peterbilt - Customer	Model:	520PB	See below
Engine:	Cummins L9N (320HP)	Axle:	6 x 4	
Transmission:	RDS 4000 series	Cab:	Cab over	
Driving config at del.:	RH drive only	Aux. Axle:	No	
Chassis dealer:		S/N:		
Contact email:		WD #:		
Other:		Availability:		
Cab color:	Factory White	Initials:		
Body color:	White N0006EA			
Chassis color:	Factory black	Paint scheme:	Match Cab: YES	
Cart type:		Cart make:	Capacity:	
Position:		Size:		
Additional Manuals:	0			

Configurative features:

BCPH2500 Crusher Panel

Compressed Natural Gas:

CCNG2503 CNG neck-mounted fuel tank (Behind Cab) - Qty 5 tanks - 82DGE

CNGI2530 Ignition interlock on filling port cap (Street side port) (Not available on transit-style port)

CNGA2500 In-cab CNG gas alarm system

CNGF2540 Transit style port on street side

Lifting arm option:

AGCD2510 Grabber counting device: counts number of carts dumped

AGRB2500 Grabber with bolted rubber blocks ILO straps

Control options:

AAAC2550 Auxiliary arm controls in-cab: RH-side- (Mini-joystick style)

Hydraulic options:

HHFR2500 Alarm for hydraulic filter replacement on return line

HHFD2530 High pressure filter with dirt alarm (arm hydraulics only)

Electrical options:

EGSE2510 Third Eye single sensor Radar Detection System

Lighting options:

AUHL-0001 LH-side hopper (1)

LSLA2520 Light: amber strobe 6" Whelen L10 in center of tailgate: in-cab switch - Qty 1

AUHL-0004 RH-side rail (4)

LWLK2525 Work light kit: dual- in-cab single manual switch - LED type

Camera options:

AUH-0000 No camera system. At customer request no camera installed at Labrie but for safety and liability reasons camera system will be retrofitted after delivery.

Body options:

BRLS2500 Central grease point for follower panel rollers

BPLS2500 Central grease point for packer shoes and rails

BCOT2500 Clean out tools (broom- hoe & shovel kit including brackets; installed at front-of-body)

BFEX2510 Fire Extinguisher- 20 lbs (standard position: body curbside unless specified otherwise by regulation)

BALS2510 Ground level grease points: for tailgate & hopper door hinges

BHWS2500 Hopper floor liner: 0.250" Hardox 450 steel

BHSL2500 Hopper side wall liners: 4mm Hardox 450 steel

Paint options:

PCBP2510 Body: 1 Color Urethane Body Paint Included in unit base price. Includes bolt-on parts painted body color

~~\$~~ 201,475



Rush Pblt Truck Centers (O500)
8700 West I-40
Oklahoma City, Oklahoma 73128

+ 3235 warranty
~~\$~~ 204,710

City Of Norman
Po Box 370
Norman, Oklahoma 73070
United States of America

William Duncan
Cell Phone: 405-922-4093
Office Phone: 405-782-3508
Email: duncanw@rushenterprises.com

Mike White

Vehicle Summary

Unit		Chassis	
Model:	Model 520	Fr Axle Load (lbs):	20000
Type:	Full Truck	Rr Axle Load (lbs):	46000
Description 1:	520 ASL CNG	G.C.W. (lbs):	66000
Description 2:	Clone of Chassis 111520 Model 520		
Application		Road Conditions:	
Intended Serv.:	Refuse/On-Highway	Class A (Highway)	100
Commodity:	Refuse, Scrap, Recycling	Class B (Hwy/Mtn)	0
		Class C (Off-Hwy)	0
		Class D (Off-Road)	0
Body		Maximum Grade:	6
Type:	Automated Side Loader	Wheelbase (in):	216
Length (ft):	24	Overhang (in):	60
Height (ft):	13.5	Fr Axle to BOC (in):	0.1
Max Laden Weight (lbs):	10000		
Trailer		Cab to Axle (in):	215.9
No. of Trailer Axles:	0	Cab to EOF (in):	275.9
Type:		Overall Comb. Length (in):	333.6
Length (ft):	0		
Height (ft):	0	Special Req.	
Kingpin Inset (in):	0		
Corner Radius (in):	0		
Restrictions			
Length (ft):	40		
Width (in):	102		
Height (ft):	13.5		

~~\$~~ 201,475

5 YEAR / 150,000 ~~\$~~ 3235
warranty

Approved by: _____

Date: _____

~~TOTAL~~ ~~\$~~ 204,710

Note: All sales are F.O.B. designated plant of manufacture.

Price Level: January 1, 2023

100% Complete

Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

Printed On: 2/1/2023 7:30:27 AM

Sales Code	Std/ Opt	Description	\$ List	Weight
Base Model				
0005201	S	Model 520 Peterbilt's Model 520 is built to withstand the harsh demands of the refuse industry. The rugged, aluminum cab delivers best-in-class durability for increased uptime and lap seam construction on a zinc-coated steel sub-frame for corrosion resistance. Bulkhead-style doors provide years of watertight performance. This low-cab forward vehicle adds a new dimension of productivity and versatility. An industry-leading, 65-degree cab tilt enhances maintenance and serviceability. Body installation is cost effective and efficient and the center console provides convenient access to body control integration points.	220,522	16,475
0091180	S	Refuse, Scrap, Recycling	0	0
0093035	S	Refuse/On-Highway Truck or tractor which hauls refuse, recycled material, etc. Includes roll-on/roll-off container movement, as well as hauling refuse from transfer stations to, but not into, landfills.	0	0
0095120	O	Automated Side Loader A lift-equipped truck used to pick up wheeled waste containers to load waste materials into the truck body. Requires a single operator. The load is removed by a tilt of the truck body.	0	0
0098170	S	United States Registry Canadian Registry Package Requires Air Conditioning Excise Tax Canada, Speedometer to be KPH ipo MPH, Daytime Running Lights and Rubber Battery Pad in Bottom of Battery Box.	0	0
Configuration				
0200672	O	Labrie Natural Gas Fuel System Assembler	0	0
Frame & Equipment				
0514160	O	10-3/4" Steel Rails 306-342" 10.75x3.5x.375 Dimension, 2,136,000 RBM; Yield Strength: 120,000 psi. Section Modulus: 17.8 cubic inches. Weight: 1.74 lbs/inch pair	441	182
0601500	O	Full Steel Inner Liner	963	672
0620110	O	FEPTO Provision 9in Bumper Extension Includes 1350 Series Front Drive PTO Attachment Provision, Radiator with PTO Cut-Out in Grille, Radiator Protection Sleeve, and Bumper Extension	1,693	42
0620500	O	Frame Components Bolted IPO Huck Fastened	91	0
0644020	O	EOF Square with Steel Crossmember	236	64
0651090	S	Omit Rear Mudflaps and Hangers	0	0
0713130	O	(2) Solid Mount Cable Hooks	0	40
Front Axle & Equipment				

Price Level: January 1, 2023

100% Complete

Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

Printed On: 2/1/2023 7:30:27 AM

Sales Code	Std/ Opt	Description	\$ List	Weight
1011890	S	PACCAR FX-20 Steer Axle 20,000 lbs. 4" Drop Axle is designed for applications with a gross axle weight rating (GAWR) of 20,000 pounds. Front axle is designed for demanding applications such as construction, heavy haul, refuse, and other vocational uses. Robust forged steel beam construction for long-lasting performance. It utilizes innovative tapered kingpin roller bearings for more efficient operation and improved steering efficiency. The PACCAR Steer Axle comes standard with the PACCAR warranty of 5 years, 750,000 miles.	0	0
1114030	S	Taper Leaf Springs, Shocks 20,000 lb Standard with Heavy Resistance Shocks.	0	0
1243010	S	Power Steering Sheppard M100 Dual Gear For use with 16,000 to 20,000 lb. axle ratings. Glidekote splines on steering shaft extend service life of components.	0	0
1354840	O	PHP10 Iron PreSet PLUS Hubs PHP10 iron PreSet PLUS hubs have a fully integrated spindle nut design, an optimized wheel spacer, magnetic fill plug on drive and trailer hubs for inspection of metal particles in lubricant, with a long life oil seal and bearings are pre-adjusted. Use with Front Axle.	-580	84
1380280	O	Bendix Air Cam Front Drum Brakes 16.5x7 For use with 16,000 lbs to 23,000 lbs steer axles or front drive axles. Includes automatic slack adjusters & outboard mounted brake drums.	682	0
1380490	O	PACCAR FX Wide Track IPO Standard 71in KPI IPO 69in front axle for improved turning radius.	0	0
1391410	O	Gusseted Cam Brackets, Steer Axle	28	0
1392970	O	Heavy Duty Cam Bushings, Steer Axle	31	0
Rear Axle & Equipment				
1523440	S	Dana Spicer D46-172 46,000 LBS Dana Spicer D46-172 46,000 lbs tandem drive axles offer efficiency improvement, axle weight reduction and reduced lube quantity.	0	0
1616300	O	PHP10 Iron PreSet PLUS Hubs	-670	0
1680280	O	Bendix Smart ATC Traction Control	266	2
1680440	O	Refuse Service Brakes, Steer And Drive Axles Designed for heavy-duty applications for refuse industry, providing long brake life, safety and performance.	0	0
1680450	O	Rear Brake Camshaft Reinforcement Rear brake camshaft reinforcement helps guard against wear and corrosion.	65	9
1680490	O	Gusseted Cam Brackets, Drive Axle(s)	72	2
1680500	S	SBM Valve Full trucks require a spring brake modulation (SBM) system for emergency braking application. This system requires an SBM valve and a relay valve with spring brakes on the rear axles. The SBM valve	0	0

Price Level: January 1, 2023

100% Complete

Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

Printed On: 2/1/2023 7:30:27 AM

Sales Code	Std/ Opt	Description	\$ List	Weight
		allows the foot valve to operate the rear axle spring brakes if a failure exists in the rear air system.		
1680910	O	Heavy Duty Brake Drums, Drive Axle(s) Use with 16.5x7 Brakes	283	21
1682430	S	Anti-Lock Braking System (ABS) 4S4M ABS-6. Includes air braking system.	0	0
1684200	S	Synthetic Axle Lubricant All Axles Peterbilt heavy duty models include Fuel Efficient Cognis EMGARD FE75W-90 which provides customers performance advantages over current synthetic lubricants with reduced gear wear and extended maintenance intervals, resulting in increased uptime. In addition, the lubricant provides improved fluid flow to protect gears in extreme cold conditions and withstand the stress from high temperatures, extending component life.	0	0
1687010	O	Bendix Air Cam Rear Drum Brakes 16.5x7 Bendix Air Cam Rear Drum Brakes to fit all heavy haul, construction, refuse and highway truck and tractor applications. Includes Automatic Slack Adjusters & Outboard Mounted Brake Drums.	-406	0
1705570	O	Ratio 5.57 Rear Axle	0	0
1824440	O	Hendrickson HMX EX 460 46,000 LBS., 52" Haulmaax, 70K Creep Rating. Includes Traax Rod as standard, option 1920905 is not needed or available. Progressive load spring system easily adjusts to the load for an enhanced combination of empty-ride quality and loaded stability.	1,968	-88
1921375	O	16.5" Saddle Height HMX EX 400/460 IPO Std 18.5"	428	0

Engine & Equipment

2056317	O	L9N 320@2000 GOV@2200 1000@1300 (2018 Emissions) Magnetic engine oil drain plug captures and holds any metal fragments in engine oil to extend service life. N21430 N201 0.....Reserve Speed Limit Offset (N21410 N202 0.....Maximum Cycle Distance (N202 N21400 N203 252...Reserve Speed Function Reset N21320 N205 120...Standard Maximum Speed Limit N21420 N206 0.....Maximum Active Distance (N20 N21470 P062 NO....Cruise Control Auto Resume (N21480 P068 NO....Auto Engine Brake in Cruise N21450 P026 NO....Gear Down Protection (P026) N21440 P015 NO....Engine Protection Shutdown (N21340 P112 93....Hard Maximum Speed Limit (P1 N21350 P001 65....Maximum Accelerator Pedal Ve N21370 P059 65....Maximum Cruise Speed (P059) N21590 P230 YES...Enable Hot Ambient Automatic N21530 P233 YES...Enable Impending Shutdown Wa N21540 P234 60....Timer For Impending Shutdown N21460 P046 1400..Max PTO Speed (P046) N21520 P030 5.....Timer Setting (P030) N21570 P031 NO....Idle Shutdown Manual Overrul	21,607	0
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Price Level: January 1, 2023

100% Complete

Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

Printed On: 2/1/2023 7:30:27 AM

Sales Code	Std/ Opt	Description	\$ List	Weight
		N21610 P172 40....Low Ambient Temperature Thre		
		N21630 P171 80....High Ambient Temperature Thr		
		N21550 P516 100...Engine Load Threshold (P516)		
		N21510 P520 YES...Enable Idle Shutdown Park Br		
		N21620 P173 60....Intermediate Ambient Tempera		
		N21330 N207 0.....Expiration Distance (N207)		
		N21500 N209 0.....Expiration Distance (N209)		
2091130	S	VMUX Electronics Architecture	0	0
2091305	O	Engine Idle Shutdown Timer Enabled	0	0
2091315	O	Enable EIST Ambient Temp Override	0	0
2091372		Eff EIST NA Expiration Miles	0	0
2091640		Effective VSL Setting NA	0	0
2092013	O	Typical Operating Speed 60 MPH	0	0
2092033	O	Powertrain Optimized for Balance Best analysis for vehicles where service includes frequent start and stop cycles.	0	0
2140220	S	CARB Engine Idling Compliance DECLINED By Dealer/Customer	0	0
2140450	O	Remote PTO/Throttle, 12-Pin Eng Bay Remote Control Provision	103	0
2140670	O	EPA Emission Warranty	0	0
2147460	S	Bed Plate for PX-9, L9N Engines Designed to increase engine longevity by incorporating a stiffener bracket on the bottom side of the engine, inside the oil pan, for additional reinforcement. Required for all PX-9/L9N refuse applications and recommended for other high load 9-liter applications.	0	0
2513060	S	PACCAR 160 Amp Alternator, Brushed PACCAR 160 AMP alternator, brushed producing 160 Amps at road speed and 100 Amps at idle.	0	0
2521090	O	Immersion Type Block Heater 110-120V Standard location for 2.1M and 1.9M models is left-hand under cab, Model 520 is in bumper, and for Model 220 it is at the driver step. Plug includes a weather-proof cover that protects the receptacle. This pre-heater keeps the coolant in the engine block from freezing when the engine is not running.	86	2
2522110	O	PACCAR 12V Starter, N/A PACCAR MX Engines PACCAR 12-volt electrical system. With centralized power distribution incorporating plug-in style relays. Circuit protection for serviceability, 12-volt light system w/circuit protection circuits number & color coded.	0	0
2538040	S	3 PACCAR Premium 12V Dual Purpose Batt 2190 CCA Threaded stud type terminal. Stranded copper battery cables are double aught (00) or larger to reduce resistance.	0	0

Price Level: January 1, 2023

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Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

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Sales Code	Std/ Opt	Description	\$ List	Weight
2539220	O	Battery Jumper Terminals Mtd In Front Of Battery Box	198	4
2539740	O	Kissling Battery Disconnect Switch 300AMP Dual Tab Mounted on Battery Box	160	3
2621000	S	2-Speed Fan Clutch For Frequent Start/Stops A 2-speed fan clutch is ideal for vocational applications where the fan clutch engagement time exceeds 10% of the engine run time. When the fan clutch is disengaged, the fan still rotates at 15-25% of the engine RPM. This fan rotation provides crucial airflow to the engine and draws virtually no horsepower.	0	0
2723210	S	18.7 CFM Air Compressor N/A X15. Furnished on engine. Teflon lined stainless steel braided compressor discharge line.	0	0
2921170	O	Spin-On Fuel/Water Separator for Natural Gas Engines	0	0
2921210	S	No Fluid Heat Option for Fuel Filter	0	0
2921310	S	No Electric Heat Option for Fuel Filter	0	0
3010400	O	Engine Protection Shutdown w/ Label Includes oil pressure, oil temperature, coolant temperature, and intake manifold temperature.	10	0
3114270	S	High Efficiency Cooling System Cooling module is a combination of steel and aluminum components, with aluminum connections to maximize performance and cooling capability. Silicone radiator & heater hoses enhance value, durability, & reliability. Constant tension band clamps reduce leaks. Chevron Delo Extended Life Coolant (NOAT) extends maintenance intervals reducing maintenance costs. Anti-freeze effective to -30 degrees F helps protect the engine. Low coolant level sensor warns of low coolant condition to prevent engine damage. Radiator Size by Model: 367 1325 sq in, 367 HH Fepto 1325 sq in, 365 Fepto 1183 sq in, 365 Full Frame Extension 1000 sq in, 520 1202 sq in, 579 1456.9 sq in, 535/536/537/548 949.3 sq in, 537/548 VOC 1000.3 sq in, 389/367 HH 1604 sq in, 365/567 1379 sq in.	0	0
3120320	O	Bugscreen	140	0
3120450	S	Stainless Steel Grille	0	0
3261980	S	Heavy Duty Air Cleaner Molded rubber air intake connections with lined stainless steel clamps seal to prevent contaminants in air intake.	0	0
3281750	O	Pre-Cleaner ECG	142	13
3365450	O	Exhaust Single LH Vertical Natural Gas Engines Only	8,885	-486
3381770	O	Curved Tip Standpipe(s)	43	1
3387650	O	36" Single Standpipe L9N Engine Only	0	0

Price Level: January 1, 2023

100% Complete

Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

Printed On: 2/1/2023 7:30:27 AM

Sales Code	Std/ Opt	Description	\$ List	Weight
Transmission & Equipment				
4052970	O	Allison 4500 RDS-P Transmission, Gen 6 Rugged Duty Series	18,543	390
4210190	O	1810 HD Driveline, 1 Midship Bearing 4.5in x .180 wall tubing	-389	15
4216590	O	1710 Driveline Interaxle For tandem rear axles	-101	-5
4252890	O	Allison FuelSense 2.0 Not Desired	-106	0
4252950	O	Omit Allison Neutral At Stop	0	0
4256020	S	Console Mounted Push Button Shifter	0	0
4256740	O	Allison 6-Speed Configuration, Wide Ratio Gears Allison 4500 transmission only	0	0
4256870	O	Allison Output Function S Neutral Indicator Allison output function S Neutral Indicator for PTO. Required on Refuse Packer Applications. With this configuration NEUTRAL only, PTO engagement is permitted only when the transmission is in Neutral. Once the transmission is in Neutral, the PTO is automatically engaged and fast idle is initiated when the PTO switch is on. In addition with this configuration Pack-on-the-fly, the PTO is automatically engaged and fast idle is initiated when the PTO switch is On concurrently with shifting of the transmission to Neutral.	0	0
Air & Trailer Equipment				
4510210	S	Bendix AD-HF EP Air Dryer, Heater Coalescing filter, extended purge. Bendix AD-HF air filters protects the life of your engine system and components. Proven PuraGuard oil coalescing technology in the the air dryer cartridge. This oil coalescing filter ensures the removal of oil and oil aerosols before they can contaminate the moisture removing desiccant.	0	0
4520180	O	Air Tank Valve Guards	23	0
4520420	O	Pull Cords All Air Tanks	3	1
4540420	S	Nylon Chassis Hose	0	0
4543320	S	Steel Painted Air Tanks All air tanks are steel with painted finish except when Code 4543330 Polish Aluminum Air Tanks is also selected (then exposed air tanks outside the frame rails will be polished aluminum). Peterbilt will determine the optimal size and location of required air tanks. Narratives requesting a specific air tank size or location will not be accepted for factory installation. See ECAT to determine number or location of air tanks installed.	0	0
Tires & Wheels				

Price Level: January 1, 2023

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Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

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Sales Code	Std/ Opt	Description	\$ List	Weight
5032320	O	FF: GY 20ply 315/80R22.5 G289 WHA Diameter = 43.1 inches; SLR = 20.0 inches. Compares to Michelin XZUS 2 and Bridgestone M860 tread.	332	-20
5130630	O	RR: GY 16ply 11R22.5 Endurance LHD Efficiency Rating: Poor Diameter= 42.4 inches; SLR= 19.9 inches	1,436	100
5190008	S	Code-rear Tire Qty 08	0	0
5210550	S	FF: Accur Std Armor 29039PK 22.5X9.00 PHP10-5 Hand Holes	0	0
5310600	S	RR: Accur Std Armor 50291PK 22.5X8.25 Heavy Duty, Two Hand Holes	0	0
5390008	S	Code-rear Rim Qty 08	0	0
Fuel Tanks				
5532010	O	No Fuel Tank/Fuel System Provided, CNG Only	-424	0
5604000	O	Location LH BOC 000 Gal	0	0
5653070	O	CNG / LNG Frame Rail Mounted Tank Only	0	0
5653180	O	CNG Fuel System Compressed Natural Gas Fuel System.	0	0
Battery Box & Bumper				
6010460	O	Aluminum Space Saver Battery Box LH Back Of Cab	145	-11
6030360	O	Mount Space Saver Battery Box Top Of Box 8" Below top of frame	722	0
6122810	O	Steel Bumper Swept Back Painted Requires bumper extension, includes two front tow eyes with pins	-20	2
6132400	O	Notched Top Flange Of Bumper Does not include fepto provisions	50	0
Cab & Equipment				
6501090	O	53" LCF ProBilt Cab RH Drive Use with auto-trans. Includes steel frames with aluminum and fiberglass panels, all aluminum doors, dual door stops, door locks, tinted safety glass thru-out, cab and door mounted entry grab handles, 65 degree hydraulic tilt, stainless steel grille, dual rear cab fenders, service module BOC (cab tilt pump, oil fill and dipstick, coolant fill and check, fluid fill and dipstick for auto trans), door mounted armrests, power windows, doghouse full insulation, rubber floor mats, ergonomic center control console, removable instrument panel, Driver Information Display, LED backlit gauges, adjustable side flip-down interior sunvisor, 16" steering wheel with integrated horn button, tilt/telescopic adjustable column, over-door storage, driver and passenger side cup holders, USB charging port and 12VDC charging outlet, header includes HVAC	1,361	0

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Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

Printed On: 2/1/2023 7:30:27 AM

Sales Code	Std/ Opt	Description	\$ List	Weight
		controls, rear cab corner windows, 18" bolt-on step on each side, self-canceling turn signals and Front Directional and Side Mounted Turn Signals.		
6540160	S	Thermal Insulation Package in Cab The thermal insulation package is designed to make the cab thermally efficient in extreme temperatures. The model 520 adds insulation surrounding the doghouse to reduce engine heat transmitted to the cab.	0	0
6800500	S	4.5" Rubber Flares On Cab And wheel well fenders	0	0
6911720	S	Peterbilt Driver Seat	0	0
6921720	S	Peterbilt Passenger Seat	0	0
6931120	O	Seat Belt Color Orange IPO Standard Black	10	0
6939400	O	Air Ride Driver	389	43
6939420	O	High Back Driver	33	0
6939470	S	Vinyl Driver	0	0
6939510	S	Non-Air Ride Passenger	0	0
6939540	S	Low Back Passenger	0	0
6939570	S	Vinyl Passenger	0	0
7000000	S	Gray Interior Color Includes ABS gray headliner & rear cab panel, gray vinyl engine tunnel cover. For LH, RH, and dual steer dual seated power windows are standard on both doors. For dual steer RH stand-up the LH window is power and the RH window is a manual sliding window.	0	0
7001520	S	Adjustable Steering Column - Tilt/Telescope	0	0
7001620	S	Steering Wheel With Peterbilt Logo Steering Wheel with embossed Peterbilt logo over horn button.	0	0
7040020	O	Diamond Plate Floor Covering on Driver side floor in place of Rubber Mat. In Dual Steer application RH Diamond Plate covering is standard. Single drive applications the Diamond Plate is optional.	46	6
7110680	S	Exterior Cab Entry Grabhandle Textured; NFPA compliant. Available on Day Cab specifications only.	0	0
7220150	O	Rear Window Back of Cab Dark Tint 18.5in X 54in	24	0
7230350	S	2-Piece Flat Windshield	0	0
7322010	S	Combo Fresh Air Heater/Air Conditioner	0	0

Price Level: January 1, 2023

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Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

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Sales Code	Std/ Opt	Description	\$ List	Weight
		With radiator mounted condenser, dedicated side window defrosters, Bi-Level Heater/Defroster Controls, 54,500 BTU/HR, and silicone heater hoses.		
7330920	O	(2) Defroster Fan On Rear Header	237	60
7410040	O	Outside Sunvisor - Stainless Steel Not available with 2.1M high roof sleeper.	366	4
7560100	O	Mirrors SSTL Each Side Heated and Motorized with Switch on Door.	-30	-7
7610020	S	(1) Air Horn 15" Painted Mounted under cab.	0	0
7722120	O	ConcertClass, AM/FM, Weatherband, 3.5 Aux	467	10
7725740	O	Midlevel Speaker Package For Cab (4) Speakers	135	6
7728020	O	Bluetooth Located On Driver Side	0	0
7728030	O	Radio Mute When In Reverse For automatic or automated transmission	0	0
7728040	O	Bluetooth Phone and Audio Requires USB Port	62	0
7728050	O	USB Port	62	0
7788055	S	SmartLINQ Remote Diagnostics SmartLINQ is Peterbilts proprietary remote diagnostics service which monitors the engine and aftertreatment for diagnostic codes providing real-time code analysis maximizing vehicle uptime and strengthening the fleets partnership with their dealer. SmartLINQ provides fault coverage for over 800 codes, a customizable email notification for 116 codes plus a web portal to manage your entire fleet included at no additional charge. SmartLINQ is compatible with any telematics system and doesnt require a specific fleet management system. For those whose customers utilize PeopleNet, the pre-wire with remote diagnostics will provide a more integrated solution utilizing the existing SmartLINQ modem. For those whose customers utilize other fleet services products, the existing pre-wire option for the other fleet service devices will continue to be available. Standard on Class 8 engines and available on Models 348, 337, 330 and 325 with a PX-9, PX-7 or Cummins Westport natural gas engine.	0	0
7788058	O	24 Months SmartLINQ Subscription Cummins Engines.	0	0
7851330	O	Cab Tilt Pump Air Assist	512	0
7851870	O	Rain Gutters Over Driver and Passenger Doors	76	8
7852150	S	Peterbilt Pantograph Windshield Wipers With intermittent feature.	0	0
7900090	O	Triangle Reflector Kit, Ship Loose	30	13

Price Level: January 1, 2023

100% Complete

Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

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Sales Code	Std/ Opt	Description	\$ List	Weight
		Florescent triangle emergency road flares are designed to meet and exceed all DOT standards.		
7901140	O	Backup Alarm (87-112 DB) Variable adjusting	129	6
8011800	O	Drive Axle #1 Front Oil Temperature Gauge Located in Digital Cluster Display.	36	0
8011810	O	Drive Axle #2 Rear Oil Temperature Gauge Located in Digital Cluster Display.	36	0
8011850	S	Transmission Oil Temperature (Main) Located in Digital Cluster Display.	0	0
8021315	S	Air Restriction Indicator Mounted on exhaust stanchion	0	0
8031120	O	Warning Light Battery Disconnect, Switch Engaged Marker light external mounted	14	0
8070260	O	Switch To Deactivate ATC Traction Control Bendix ATC is required on the specification. Switch is to temporarily disable the Traction Control in extreme conditions such as snow, ice or mud. The ATC warning light will display in a constant state.	0	0
8070880	O	Main Instrumentation Panel (Gas Engine) Digital Cluster 7" Display includes: Physical (Analog) - Speedometer, Tachometer, Oil Pressure, Coolant Temp and Display Gauges - Fuel Level, Volts Telltale, OAT and Primary Air Pressure, Secondary Air Pressure for air brake trucks.	0	0
8110090	S	Headlights Single Rectangular Halogen	0	0
8120570	S	(5) LED Clearance With (2) LED Marker Lights Includes (5) lights mounted on roof of cab and (1) cab side marker light mounted in front of each cab door	0	0
8133900	S	None Furnished Stop/Tail/Backup Lights Available with full truck only, not available with tractor	0	0
8134160	O	Self-Canceling Turn Signal	0	0

Paint

8530770	O	(1) Color Axalta Two Stage - Cab/Hood Base Coat/Clear Coat N85020 A - L0895EY GREEN N85700 BUMPER L0001EA BLACK N85500 CAB ROOF L0895EY GREEN N85200 FRAME L0001EA BLACK	0	0
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Shipping Destination

Options Not Subject To Discount

9400090	S	Peterbilt Class 8 Standard Coverage 1 year/100,000 Miles (160,000 km)	0	0
9407147	O	Fuel Price Index Factor \$438 NET	438	0

Miscellaneous

Price Level: January 1, 2023

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Date: February 01, 2023

Deal: 520 ASL CNG

Quote Number: QUO-1026837-T5Z7C8

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Sales Code	Std/ Opt	Description	\$ List	Weight
9409086	O	State Registry: Oklahoma	0	0

Promotions

Order Comments

Total List Price (W/O Freight & Warranty & Surcharges)	\$281,696
Marketing and Service Support Fee	\$1,095
Prepaid Freight	\$4,300
Total Surcharge/Options Not Subject To Discount	\$438
Total Weight	17,664

Prices and Specifications Subject to Change Without Notice.

Unpublished options may require review/approval.
Dimensional and performance data for unpublished options may vary from that displayed in CRM.

PRICING DISCLAIMER

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File Attachments for Item:

12. CONSIDERATION OF AWARDING, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID 2223-43: SUBMITTED BY CARGILL IN THE AMOUNT OF \$257 PER TON FOR THE PURCHASE OF SALT FOR THE WATER TREATMENT FACILITY.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 01/24/2023

REQUESTER: ANDREW BRUEHL, UTILITIES SUPERVISOR

PRESENTER: GERI WELLBORN, UTILITIES MANAGER

ITEM TITLE: CONSIDERATION OF AWARDING, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID 2223-43:
SUBMITTED BY CARGILL IN THE AMOUNT OF \$257 PER TON FOR THE PURCHASE OF SALT FOR THE WATER TREATMENT FACILITY.

BACKGROUND:

On January 12, 2023, bids were opened for Bid 2223-43 regarding the purchase of Salt. Salt is used for generating bleach disinfectant in the treatment of water. Funds in the amount of \$1,002,299 have been budgeted in the fiscal year 2022-2023 (FYE 2023) budget, Water Fund - Water Treatment Plant - Operating Chemicals (account 31955234 43108) for purchase of all treatment chemicals.

DISCUSSION:

Specifications regarding Bid 2223-43 for Salt were sent to three (3) vendors and two (2) bids were received. Cargill of White Marsh, MD, submitted the lowest and best bid meeting all specifications in the amount of \$257 per ton. This compares to a cost of \$133.29 per ton last year for an increase of 92.81 percent (92.8%). This increase has occurred due mostly to the rise in transportation costs.

RECOMMENDATION:

Purchases will be made throughout FYE 2024. Bids have been examined by staff and found to be in order and proper as to form. Based upon the above information, staff recommends acceptance of the lowest and best bid provided by Cargill.

WATER TREATMENT PLANT CHEMICALS – Salt
TABULATION OF BIDS
January 12, 2023

Item 12.

Bid No. 2223-43

	Cargill White Marsh, MD	Morton Salt Chicago, IL	Univar Downers Grove, IL
ITEM	PRICE	PRICE	PRICE
Salt (Price per ton	\$257.00/ton	\$577.81/ton	No Bid

File Attachments for Item:

13. CONSIDERATION OF ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A WATERSMART GRANT IN THE AMOUNT OF \$2,000,000 AS ADMINISTERED BY THE BUREAU OF RECLAMATION FOR USE ON THE ADVANCED WATER METERING PROJECT TO BE COMPLETED BY THE UTILITIES DEPARTMENT AND BUDGET APPROPRIATIONS AS OUTLINED IN THE STAFF REPORT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: February 14, 2023

REQUESTER: Nathan Madenwald, P.E., Utilities Engineer

PRESENTER: Nathan Madenwald, P.E., Utilities Engineer

ITEM TITLE: CONSIDERATION OF ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A WATERSMART GRANT IN THE AMOUNT OF \$2,000,000 AS ADMINISTERED BY THE BUREAU OF RECLAMATION FOR USE ON THE ADVANCED WATER METERING PROJECT TO BE COMPLETED BY THE UTILITIES DEPARTMENT AND BUDGET APPROPRIATIONS AS OUTLINED IN THE STAFF REPORT.

BACKGROUND:

The City of Norman water system includes approximately 41,000 water meters that measure water usage for water and sewer billing purposes. The majority of the meters (approximately 39,000) are manually read by meter readers (physically remove the meter lid and read the current usage on the register) and 2,000 meters are read using automated meter reading (AMR) (remote sensor used to collect data while driving by in a truck). As the number of meters increase, staffing levels would have to proportionally increase to ensure that meters are read timely and accurately. Insufficient staffing levels can result in missed reads or inaccurate reads that impact customer service and billing revenues. Additionally, the majority of the water meters in Norman have aged past their expected useful life and warrant replacement.

Contract K-2021-75 with E Source Companies, LLC was approved on June 8, 2021, by the Norman Utilities Authority (NUA). Amendment No. 1 to the contract was approved on October 26, 2021, to complete the procurement phase of the project. Amendment No. 2 was approved on December 13, 2022, to complete the implementation and closeout phase of the project. The procurement phase of the project is ongoing and E Source is currently negotiating the contract.

Resolution R-2122-43 was approved by the NUA on October 26, 2021, authorizing staff to submit a grant application through the Bureau of Reclamation (BOR) for the Advanced Water Metering Project. The BOR made available Funding Opportunity R22AS00023 titled *WaterSMART Grants: Water and Energy Efficiency Grants for fiscal year (FY) 2022* with funding possible within two groups: Group I – Up to \$500,000, and Group II – Up to \$2,000,000.

On October 25, 2022, the NUA and City Council approved Resolutions R-2223-49 and R-2223-50, authorizing indebtedness through the Oklahoma Water Resources Board's Statewide

Revolving Fund loan program, not to exceed \$15,000,000 to fund the Advanced Meter Infrastructure project.

DISCUSSION:

Staff submitted the WaterSmart grant application on November 3, 2021, in accordance with the funding opportunity requirements. On May 11, 2022, the BOR issued a letter regarding the application indicating that the application was sufficient to qualify for funding for Group I in the amount of \$500,000 but did not qualify for Group II funding. However, the application was also used for consideration for funding under the Bipartisan Infrastructure Law (BIL) in the amount of \$2,000,000. The application was deemed successful for BIL funding and the BOR issued the Notice of Award on December 5, 2022.

The received grant funds will be used for the Advanced Water Metering project. Grant proceeds will be recorded into Other Revenue – Miscellaneous Grant Reimbursement (Account 319-331346). Additionally, the following appropriations are proposed:

1. Appropriate \$2,000,000 from Other Revenue – Miscellaneous Grant Reimbursement account (319-331346) into Advanced Water Metering, Construction (Account 31993361-46101; Project WB0351); and
2. Appropriate \$13,627,000 from Water Fund, 2022 OWRB Loan Proceeds (31-29000) into Advanced Water Metering, Construction (Account 31993361-46101; Project WB0351).

The appropriation of the loan proceeds is necessary to cover the match requirement for the grant.

RECOMMENDATION 1: Staff recommends the Norman Utilities Authority accept Grant R22AP00649-00 in the amount of \$2,000,000 from the Bureau of Reclamation.

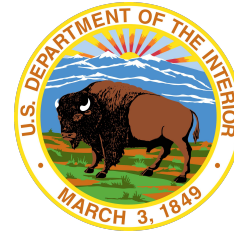
RECOMMENDATION 2: Staff recommends \$2,000,000 be appropriated to the Advanced Water Metering, Construction account.

RECOMMENDATION 3: Staff recommends \$13,627,000 be appropriated to the Advanced Water Metering Construction account.

1. DATE ISSUED MM/DD/YYYY 12/05/2022		1a. SUPERSEDES AWARD NOTICE dated except that any additions or restrictions previously imposed remain in effect unless specifically rescinded	
2. CFDA NO. 15.507 - WaterSMART (Sustain and Manage America's Resources for Tomorrow)			
3. ASSISTANCE TYPE Project Grant			
4. GRANT NO. R22AP00649-00 Originating MCA #		5. TYPE OF AWARD Other	
4a. FAIN R22AP00649		5a. ACTION TYPE New	
6. PROJECT PERIOD MM/DD/YYYY From 12/05/2022		Through MM/DD/YYYY 03/31/2025	
7. BUDGET PERIOD MM/DD/YYYY From 12/05/2022		Through MM/DD/YYYY 03/31/2025	

NOTICE OF AWARD

Item 13.



AUTHORIZATION (Legislation/Regulations)

P.L. 111-11 Section 9504(a) Water Management Improvement of the
Omnibus Lands Management Act of 2009

8. TITLE OF PROJECT (OR PROGRAM) Norman Utilities Authority Advanced Metering Infrastructure (AMI) Implementation Project	
9a. GRANTEE NAME AND ADDRESS CITY OF NORMAN 201 W Gray St Norman, OK, 73069-7108	9b. GRANTEE PROJECT DIRECTOR Mr. Nathan Madenwald 201 W Gray Street - Building C Norman, OK, 73069-7108 Phone: (405) 366-5426
10a. GRANTEE AUTHORIZING OFFICIAL Mr. Nathan Madenwald 201 W Gray Street Norman, OK, 73069-7108 Phone: (405) 366-5426	10b. FEDERAL PROJECT OFFICER Joshua German

ALL AMOUNTS ARE SHOWN IN USD

11. APPROVED BUDGET (Excludes Direct Assistance)		12. AWARD COMPUTATION	
I Financial Assistance from the Federal Awarding Agency Only		a. Amount of Federal Financial Assistance (from item 11m) \$ 2,000,000.00	
II Total project costs including grant funds and all other financial participation		b. Less Unobligated Balance From Prior Budget Periods \$ 0.00	
		c. Less Cumulative Prior Award(s) This Budget Period \$ 0.00	
		d. AMOUNT OF FINANCIAL ASSISTANCE THIS ACTION \$ 2,000,000.00	
		13. Total Federal Funds Awarded to Date for Project Period \$ 2,000,000.00	
		14. RECOMMENDED FUTURE SUPPORT (Subject to the availability of funds and satisfactory progress of the project):	
		YEAR TOTAL DIRECT COSTS YEAR TOTAL DIRECT COSTS	
		a. 2 \$ d. 5 \$	
		b. 3 \$ e. 6 \$	
		c. 4 \$ f. 7 \$	
		15. PROGRAM INCOME SHALL BE USED IN ACCORD WITH ONE OF THE FOLLOWING ALTERNATIVES:	
		a. DEDUCTION b. ADDITIONAL COSTS c. MATCHING d. OTHER RESEARCH (Add / Deduct Option) e. OTHER (See REMARKS)	
		e	
		16. THIS AWARD IS BASED ON AN APPLICATION SUBMITTED TO, AND AS APPROVED BY, THE FEDERAL AWARDING AGENCY ON THE ABOVE TITLED PROJECT AND IS SUBJECT TO THE TERMS AND CONDITIONS INCORPORATED EITHER DIRECTLY OR BY REFERENCE IN THE FOLLOWING:	
		a. The grant program legislation b. The grant program regulations. c. This award notice including terms and conditions, if any, noted below under REMARKS. d. Federal administrative requirements, cost principles and audit requirements applicable to this grant.	
		In the event there are conflicting or otherwise inconsistent policies applicable to the grant, the above order of precedence shall prevail. Acceptance of the grant terms and conditions is acknowledged by the grantee when funds are drawn or otherwise obtained from the grant payment system.	

REMARKS (Other Terms and Conditions Attached -
See next page☒ Yes ☐ No

GRANTS MANAGEMENT OFFICIAL:

Edmund Weakland, Grants Management Specialist
Bureau of Reclamation Main Interior Building
84-27132, PO Box 25007
Denver, CO, 80225-1000
Phone: 303-445-3757

17. VENDOR CODE 0071375225		18a. UEI DHCNQR5LNB6		18b. DUNS 832238146		19. CONG. DIST. 04	
LINE#	FINANCIAL ACCT	AMT OF FIN ASST	START DATE	END DATE	TAS ACCT	PO LINE DESCRIPTION	
1	0051027713-00010	\$2,000,000.00	12/05/2022	03/31/2025	0680	R-DO-2022-001408 WEEG City of Norman / N	

1075

NOTICE OF AWARD (Continuation Sheet)

PAGE 2 of 3

DATE ISSUED
12/05/2022

GRANT NO. R22AP00649-00

REMARKS:

Recipients are NOT required to sign the Notice of Award or any other award document or amendment. Recipients indicate their acceptance of an award or amendment to an existing award, including award terms and conditions, by starting work, drawing down funds, or accepting the award or amendment via electronic means. Recipient acceptance of an award/amendment carries with it the responsibility to be aware of and comply with all terms and conditions applicable to the award. Recipients are responsible for ensuring that their subrecipients and contractors are aware of and comply with applicable award statutes, regulations, and terms and conditions. Recipient failure to comply with award terms and conditions can result in Reclamation taking one or more of the remedies and actions described in 2 CFR 200.339343.

Program Income is not allowed

NOTICE OF AWARD (Continuation Sheet)

PAGE 3 of 3

DATE ISSUED
12/05/2022

GRANT NO. R22AP00649-00

Federal Financial Report Cycle

Reporting Period Start Date	Reporting Period End Date	Reporting Type	Reporting Period Due Date
12/05/2022	03/31/2023	Semi-Annual	04/30/2023
04/01/2023	09/30/2023	Semi-Annual	10/30/2023
10/01/2023	03/31/2024	Semi-Annual	04/30/2024
04/01/2024	09/30/2024	Semi-Annual	10/30/2024
10/01/2024	03/31/2025	Final	06/29/2025

Performance Progress Report Cycle

Reporting Period Start Date	Reporting Period End Date	Reporting Type	Reporting Period Due Date
12/05/2022	03/31/2023	Semi-Annual	04/30/2023
04/01/2023	09/30/2023	Semi-Annual	10/30/2023
10/01/2023	03/31/2024	Semi-Annual	04/30/2024
04/01/2024	09/30/2024	Semi-Annual	10/30/2024
10/01/2024	03/31/2025	Final	06/29/2025

AWARD ATTACHMENTS

CITY OF NORMAN

R22AP00649-00

1. Agreement

UNITED STATES DEPARTMENT OF THE INTERIOR

ASSISTANCE AGREEMENT

R22AP00649

Between

Bureau of Reclamation

And

City of Norman

For

Norman Utilities Authority Advanced Metering Infrastructure (AMI) Implementation Project

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**Financial Assistance Agreement
Between
Bureau of Reclamation
And
The City of Norman
For
Norman Utilities Authority Advanced Metering Infrastructure (AMI) Implementation
Project**

I. OVERVIEW AND SCHEDULE

1. AUTHORITY

This Financial Assistance Agreement (Agreement) is entered into between the United States of America, acting through the Department of the Interior, Bureau of Reclamation (Reclamation) and The City of Norman (Recipient), pursuant to Section 9504(a) of the SECURE WATER ACT, Subtitle F of Title IX of the OMNIBUS PUBLIC LAND MANAGEMENT ACT OF 2009, Public Law 111-11 (42 United States Code 10364) as amended (the “Act”).

2. PUBLIC PURPOSE OF SUPPORT OR STIMULATION

The Norman Utilities Authority Advanced Metering Infrastructure (AMI) Implementation project (Project) achieves the public purpose of the Act by conserving water and improving water management.

3. BACKGROUND AND OBJECTIVES

Through WaterSMART (Sustain and Manage America’s Resources for Tomorrow), Reclamation leverages Federal and non-Federal funding to work cooperatively with states, tribes, and local entities as they plan for and implement actions to increase water supply sustainability through investments and attention to local water conflicts.

Through Water and Energy Efficiency Grants, Reclamation provides assistance to states, tribes, irrigation districts, water districts, other entities with water or power delivery authority, and non-profit conservation groups to undertake projects that result in quantifiable and sustained water savings, implement renewable energy components, and support broader water reliability benefits.

The City of Norman will replace 40,973 existing water meters, the majority of which are manual read meters, with advanced metering infrastructure (AMI) meters. The project also includes and an AMI network, Meter Data Management System software, and a customer portal to provide customers with near real-time water use data. The project is expected to result in annual water savings of 1,981 acre-feet, which will improve the City’s resiliency in times of drought and will help maintain water levels in the Lake Thunderbird watershed, Garber Wellington Aquifer, Oklahoma City surface reservoirs, and the Canadian River.

evaluation of the Project, it was determined that these improvements are expected to result in annual water savings of 1,981 acre-feet.

The milestones* for completing the Project are:

Milestone / Task / Activity	Planned Start Date	Planned Completion Date
Complete required environmental and cultural compliance	8/24/2022	11/24/2022
Procurement of AMI meters	4/1/2023	3/31/2025
AMI installation in initial deployment area (IDA)	7/1/2023	12/31/2023
Complete IDA testing and procurement	-	3/31/2024
Mass AMI installation – 50% complete	4/1/2024	9/30/2024
Mass AMI installation – 100% complete	10/1/2024	3/31/2025

6. RESPONSIBILITY OF THE PARTIES

6.1 Recipient Responsibilities

6.1.1 The Recipient shall carry out the Scope of Work (SOW) in accordance with the terms and conditions stated herein. The Recipient shall adhere to Federal, state, and local laws, regulations, and codes, as applicable, and shall obtain all required approvals and permits. If the SOW contains construction activities, the Recipient is responsible for construction inspection, oversight, and acceptance. If applicable, the Recipient shall also coordinate and obtain approvals from site owners and operators.

6.1.2 Interim Performance Reports. The Recipient shall prepare and submit to Reclamation interim Project performance reports (Interim Performance Reports) as required by Section I.10 of this Agreement. Each Interim Performance Report will include (but is not limited to) the information identified in paragraph I.10.3 and will discuss the following:

- A comparison of actual accomplishments to the milestones established by the financial assistance agreement for the reporting period
- The reasons why established milestones were not met, if applicable
- The status of milestones from the previous reporting period that were not met, if applicable
- Whether the Project is on schedule and within the original cost estimate
- Any additional pertinent information or issues related to the status of the Project

6.1.3 Final Project Report. The Recipient shall prepare and submit to Reclamation a final Project performance report (Final Project Report) as required by Section I.10 of this Agreement. The Final Project Report will include (but is not limited to) the information identified in paragraph I.10.3 and will discuss the following:

- Whether the Project objectives and goals were met
- The amount of water conserved, if applicable, including information and/or calculations supporting that amount
- The amount of energy the renewable energy system is generating annually, if applicable
- How the Project demonstrated collaboration, if applicable

Photographs documenting the project are also appreciated. Recipient understands that Reclamation may print photos with appropriate credit to Recipient. Recipient also understands that the Final Project Report is a public document and may be made available on Reclamation's website, www.usbr.gov/watersmart/.

6.1.4 Tangible Personal Property. The Recipient shall use materials and supplies purchased under this Agreement in accordance with 2 CFR §200.314. Within 90 days after the period of performance is complete, the Recipient shall complete and submit a Tangible Personal Property Report (SF-428); Final Report (SF-424B); Disposition Request (SF-424C); and, if appropriate, Supplemental Form (SF-428S). If the value of the remaining materials and supplies exceeds \$5,000 in total aggregate value upon termination or completion of the project or program and the supplies are not needed for any other Federal award, the Recipient must retain the supplies for use on other activities or sell them, but must, in either case, compensate the Federal Government for its share. Should the personal property be sold, the Recipient may deduct and retain from the Federal share \$500.00 or ten percent of the proceeds, whichever is less, for its selling and handling expenses.

6.2 Reclamation Responsibilities

6.2.1 Reclamation will monitor and provide Federal oversight of activities performed under this Agreement. Monitoring and oversight includes review and approval of financial status and performance reports, payment requests, and any other deliverables identified as part of the SOW. Additional monitoring activities may include site visits, conference calls, and other on-site and off-site monitoring activities. At the Recipient's request, Reclamation may also provide technical assistance to the Recipient in support of the SOW and objectives of this Agreement.

7 BUDGET

7.1 Budget Estimate. The following is the estimated budget for this Agreement. As Federal financial assistance agreements are cost-reimbursable, the budget provided is for estimation purposes only. Final costs incurred under the budget categories listed may be either higher or lower than the estimated costs. All costs incurred by the Recipient under this Agreement must be in accordance with any pre-award clarifications conducted between the Recipient and Reclamation, as well as with the terms and conditions of this Agreement. Final determination of

the allowability, allocability, or reasonableness of costs incurred under this Agreement is the responsibility of the GO. Recipients are encouraged to direct any questions regarding allowability, allocability or reasonableness of costs to the GO for review prior to incurrence of the costs in question.

Summary Figures in this summary table are calculated from entries made in subsequent categories, only blank white cells require data entry.			
6. Budget Object Category	Total Cost	Federal Estimated Amount	Non-Federal Estimated Amount
a. Personnel	\$0		
b. Fringe Benefits	\$0		
c. Travel	\$0		
d. Equipment	\$0		
e. Supplies	\$0		
f. Contractual	\$0		
g. Construction	\$14,355,404		
h. Other Direct Costs	\$0		
i. Total Direct Costs	\$14,355,404		
i. Indirect Charges	\$0		
Total Costs	\$14,355,404	\$2,000,000	\$12,355,404
Cost Share Percentage		14%	86%

7.2 Cost Sharing Requirement

At least 50% non-Federal cost-share is required for costs incurred under this Agreement. Based on the budget estimate reflected in Section 7.1 above, the estimated Federal share of allowable costs is **14% (\$2,000,000)** and the Recipient's estimated non-Federal cost share is **86% (\$12,355,404)**. The Federal share of allowable costs shall not be expended in advance of the Recipient's non-Federal share. It is expected that expenditure of Federal and non-Federal funds based upon the estimated cost share percentages shall occur concurrently. At the end of the period of performance, if the final costs are lower than the original estimate and the 50% non-Federal cost share is met, the final payment and financial report can reflect a lower Recipient cost share than the original budget estimate.

If a bona fide need arises which requires the expenditure of Federal funds in advance of the Recipient share, then the Recipient must request written approval from the Reclamation GO prior to the expenditure. Recipient may not expend their agreed upon share of costs in advance of the expenditure of Federal funds without prior written approval.

7.3 Pre-Award Incurrence of Costs

The Recipient shall be entitled to reimbursement for costs incurred on or after August 01, 2022, which if had been incurred after this Agreement was entered into, would have been allowable, allocable, and reasonable under the terms and conditions of this Agreement.

7.4 Allowable Costs

Costs incurred for the performance of this Agreement must be allowable, allocable to the project, and reasonable. The following regulations, codified within the Code of Federal Regulations (CFR), governs the allowability of costs for Federal financial assistance:

2 CFR 200 Subpart E, “Cost Principles”

Expenditures for the performance of this Agreement must conform to the requirements within this CFR. The Recipient must maintain sufficient documentation to support these expenditures. Questions on the allowability of costs should be directed to the GO responsible for this Agreement.

The Recipient shall not incur costs or obligate funds for any purpose pertaining to operation of the program or activities beyond the expiration date stated in the Agreement. The only costs which are authorized for a period of up to **120 calendar days** following the project performance period are those strictly associated with closeout activities for preparation of the final reports.

7.5 Revision of Budget and Program Plans

In accordance with 2 CFR 200.308(h) the recipient must request prior written approval for any of the following changes:

- (a) A change in the approved scope of work or associated tasks, even if there is no associated budget revisions.
- (b) Revisions which require additional Federal funds to complete the project.
- (c) Revisions which involve specific costs for which prior written approval requirements may be imposed consistent with OMB cost principles listed in 2 CFR 200 Subpart E “Cost Principles”

7.6 Amendments

Any changes to this Agreement shall be made by means of a written amendment. Reclamation may make changes to the Agreement by means of a unilateral amendment to address changes in address, no-cost time extensions, changes to Key Personnel, the addition of previously agreed upon funding, or administrative corrections which do not impact the terms and conditions of this Agreement. Additionally, a unilateral amendment may be utilized by Reclamation if it should become necessary to suspend or terminate the Agreement in accordance with 2 CFR 200.340.

All other changes shall be made by means of a bilateral amendment to the Agreement. No oral statement made by any person, or written statement by any person other than the GO, shall be allowed in any manner or degree to amend, modify or otherwise effect the terms of the Agreement.

All requests for amendment of the Agreement shall be made in writing, provide a full description of the reason for the request, and be sent to the attention of the GO. Any request for project period extension shall be made at least 45 days prior to the end of the project period of the Agreement or the project period date of any extension that may have been previously granted. Any determination to extend the project period or to provide follow-on funding for continuation of a project is solely at the discretion of Reclamation.

8. KEY PERSONNEL

8.1 Recipient's Key Personnel.

The Recipient's Project Manager for this Agreement shall be:

Nathan Madenwald
Utilities Engineer
201 W. Grat Street – Building C
Norman, OK 73069
405-366-5426
Nathan.madenwald@normanok.gov

9. LIMITATION OF AUTHORITIES

9.1 Grants Officer (GO).

The Reclamation GO is the only official with legal delegated authority to represent Reclamation. The Reclamation GO's responsibilities include, but are not limited to, the following:

- (a) Formally obligate Reclamation to expend funds or change the funding level of the Agreement;
- (b) Approve through formal amendment changes in the scope of work and/or budget;
- (c) Approve through formal amendment any increase or decrease in the project period of the Agreement;
- (d) Approve through formal amendment changes in any of the expressed terms, conditions, or specifications of the Agreement;
- (e) Be responsible for the overall administration, management, and other non-programmatic aspects of the Agreement including, but not limited to, interpretation of financial assistance statutes, regulations, circulars, policies, and terms of the Agreement; and

- (f) Where applicable, ensures that Reclamation complies with the administrative requirements required by statutes, regulations, circulars, policies, and terms of the Agreement.

9.2 Grants Management Specialist.

The Reclamation Grants Management Specialist (GMS) is the primary administrative point of contact for this Agreement and should be contacted regarding issues related to the day-to-day management of the Agreement. Requests for approval regarding the terms and conditions of the Agreement, including but not limited to amendments and prior approval, may only be granted, in writing, by a Reclamation GO. Please note that for some Agreements, the Reclamation GO and the Reclamation GMS may be the same individual.

10. REPORTING REQUIREMENTS AND DISTRIBUTION

10.1 Noncompliance. Failure to comply with the reporting requirements contained in this Agreement may be considered a material noncompliance with the terms and conditions of the award. Noncompliance may result in withholding of payments pending receipt of required reports, denying both the use of funds and matching credit for all or part of the cost of the activity or action not in compliance, whole or partial suspension or termination of the Agreement, recovery of funds paid under the Agreement, withholding of future awards, or other legal remedies in accordance with 2 CFR 200.339.

10.2 Financial Reports. Federal Financial Reports shall be submitted by means of the SF-425 and shall be submitted according to the Report Frequency and Distribution schedule below. All financial reports shall be signed by an Authorized Certifying Official for the Recipient's organization.

10.3 Monitoring and Reporting Program Performance

- (a) Monitoring by the non-Federal entity. The non-Federal entity is responsible for oversight of the operations of the Federal award supported activities. The non-Federal entity must monitor its activities under Federal awards to assure compliance with applicable Federal requirements and performance expectations are being achieved. Monitoring by the non-Federal entity must cover each program, function or activity. See also 2 CFR 200.332 Requirements for pass-through entities.
- (b) Non-construction performance reports. The Federal awarding agency must use standard, OMB-approved data elements for collection of performance information (including performance progress reports, Research Performance Progress Report, or such future collections as may be approved by OMB and listed on the OMB Web site).
 - (1) The non-Federal entity must submit performance reports at the interval required by the Federal awarding agency or pass-through entity to best inform improvements in program outcomes and productivity. Intervals must be no less frequent than annually nor more frequent than quarterly except in unusual circumstances, for example where

more frequent reporting is necessary for the effective monitoring of the Federal award or could significantly affect program outcomes. Annual reports must be due **90 calendar days** after the reporting period; quarterly or semiannual reports must be due **30 calendar days** after the reporting period. Alternatively, the Federal awarding agency or pass-through entity may require annual reports before the anniversary dates of multiple year Federal awards. The final performance report will be due **120 calendar days** after the project period end date. If a justified request is submitted by a non-Federal entity, the Federal agency may extend the due date for any performance report.

- (2) The non-Federal entity must submit performance reports using OMB-approved governmentwide standard information collections when providing performance information. As appropriate in accordance with above mentioned information collections, these reports will contain, for each Federal award, brief information on the following unless other collections are approved by OMB:
 - (i) A comparison of actual accomplishments to the objectives of the Federal award established for the period. Where the accomplishments of the Federal award can be quantified, a computation of the cost (for example, related to units of accomplishment) may be required if that information will be useful. Where performance trend data and analysis would be informative to the Federal awarding agency program, the Federal awarding agency should include this as a performance reporting requirement.
 - (ii) The reasons why established goals were not met, if appropriate.
 - (iii) Additional pertinent information including, when appropriate, analysis and explanation of cost overruns or high unit costs.
- (c) Construction performance reports. For the most part, onsite technical inspections and certified percentage of completion data are relied on heavily by Federal awarding agencies and pass-through entities to monitor progress under Federal awards and subawards for construction. The Federal awarding agency may require additional performance reports only when considered necessary.
- (d) Significant developments. Events may occur between the scheduled performance reporting dates that have significant impact upon the supported activity. In such cases, the non-Federal entity must inform the Federal awarding agency or pass-through entity as soon as the following types of conditions become known:
 - (1) Problems, delays, or adverse conditions which will materially impair the ability to meet the objective of the Federal award. This disclosure must include a statement of the action taken, or contemplated, and any assistance needed to resolve the situation.

- (2) Favorable developments which enable meeting time schedules and objectives sooner or at less cost than anticipated or producing more or different beneficial results than originally planned.

Reclamation requires Performance reporting for all financial assistance awards, both Construction and non-Construction. Performance reports for Construction agreements shall meet the same minimum requirements outlined in paragraph (b)(2) above.

10.4 Report Frequency and Distribution. The following table sets forth the reporting requirements for this Agreement. Please note the first report due date listed for each type of report.

Required Reports	Interim Reports	Final Report
Performance Report		
Format	No specific format required. See content requirements within Section 10.3 and any program specific reporting requirements identified in Section 6.1 of this Agreement	Summary of activities completed during the entire period of performance is required. See content requirements within Section 10.3 and any program specific reporting requirements identified in Section 6.1 of this Agreement.
Reporting Frequency	Semi-Annual	Final Report due within 120 calendar days after the end of the period of performance
Reporting Period	October 1 through March 31 and April 1 through September 30.	Entire period of performance
Due Date	Within 30 calendar days after the end of the Reporting Period	Final Report due within 120 calendar days after the end of the period of performance or completion of the project
First Report Due Date	The first performance report is due for reporting period ending 03/31/2023	N/A
Submit to:	GrantSolutions or sha-dro-faoperations@usbr.gov	GrantSolutions or sha-dro-faoperations@usbr.gov
Federal Financial Report		
Format	SF-425 (all sections must be completed)	SF-425 (all sections must be completed)
Reporting Frequency	Semi-Annual	Final Report due within 120 calendar days after the end of the period of performance or completion of the project
Reporting Period	October 1 through March 31 and April 1 through September 30.	Entire period of performance

Required Reports	Interim Reports	Final Report
Due Date	Within 30 calendar days after the end of the Reporting Period.	Final Report due within 120 calendar days after the end of the period of performance or completion of the project.
First Report Due Date	The first Federal financial report is due for reporting period ending 03/31/2023	N/A
Submit to:	GrantSolutions or <u>sha-dro-faoperations@usbr.gov</u>	GrantSolutions or <u>sha-dro-faoperations@usbr.gov</u>

11. REGULATORY COMPLIANCE

The Recipient agrees to comply or assist Reclamation with all regulatory compliance requirements and all applicable state, Federal, and local environmental and cultural and paleontological resource protection laws and regulations as applicable to this project. These may include, but are not limited to, the National Environmental Policy Act (NEPA), including the Council on Environmental Quality and Department of the Interior regulations implementing NEPA, the Clean Water Act, the Endangered Species Act, consultation with potentially affected Tribes, and consultation with the State Historic Preservation Office. Once regulatory compliance is complete, a Reclamation GO will issue a Notice to Proceed along with the compliance documentation notifying the Recipient that compliance is complete and on-the-ground work can commence on the project. If the Recipient begins project activities that require environmental or other regulatory compliance approval prior to receipt of written notice from the Reclamation GO that all such clearances have been obtained, then Reclamation reserves the right to initiate remedies for non-compliance as defined by 2 CFR 200.339 up to and including unilateral termination of this agreement per 2 CFR 200.340.

12. AGRICULTURAL OPERATIONS [Public Law 111-11, Section 9504(a)(3)(B)]

The Recipient shall not use any associated water savings to increase the total irrigated acreage of the Recipient or otherwise increase the consumptive use of water in the operation of the Recipient, as determined pursuant to the law of the State in which the operation of Recipient is located.

13. TITLE TO IMPROVEMENTS [Public Law 111-11, Section 9504(a)(3)(D)]

If the activities funded under this Agreement result in an infrastructure improvement to a federally owned facility, the Federal Government shall continue to hold title to the facility and improvements to the facility.

14. OPERATION AND MAINTENANCE COSTS [Public Law 111-11, Section 9504(a)(3)(E)(iv.)]

The non-Federal share of the cost of operating and maintaining any infrastructure improvement funded through this Agreement shall be 100 percent.

15. LIABILITY [Public Law 111-11, Section 9504(a)(3)(F)]

- (a) **IN GENERAL.**—Except as provided under chapter 171 of title 28, United States Code (commonly known as the “Federal Tort Claims Act”), the United States shall not be liable for monetary damages of any kind for any injury arising out of an act, omission, or occurrence that arises in relation to any facility created or improved under this Agreement, the title of which is not held by the United States.
- (b) **TORT CLAIMS ACT.**—Nothing in this section increases the liability of the United States beyond that provided in chapter 171 of title 28, United States Code (commonly known as the “Federal Tort Claims Act”).

16. BUY AMERICA DOMESTIC PROCUREMENT PREFERENCE

As required by Section 70914 of the Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act), P.L. 117-58, on or after May 14, 2022, none of the funds under a federal award that are part of Federal financial assistance program for infrastructure may be obligated for a project unless all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States, unless subject to an approved waiver. The requirements of this section must be included in all subawards, including all contracts and purchase orders for work or products under this program.

Recipients of an award of Federal financial assistance are hereby notified that none of the funds provided under this award may be used for a project for infrastructure unless:

1. all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
2. all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
3. all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project, but are not an integral part of the structure or permanently affixed to the infrastructure project.

For further information on the Buy America preference, please visit www.doi.gov/grants/BuyAmerica. Additional information can also be found at the White House Made in America Office website: www.whitehouse.gov/omb/management/made-in-america/.

Waivers

When necessary, recipients may apply for, and the Department of the Interior (DOI) may grant, a waiver from these requirements, subject to review by the Made in America Office. The DOI may waive the application of the domestic content procurement preference in any case in which it is determined that one of the below circumstances applies:

1. Non-availability Waiver: the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality;
2. Unreasonable Cost Waiver: the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent; or
3. Public Interest Waiver: applying the domestic content procurement preference would be inconsistent with the public interest.

There may be instances where an award qualifies, in whole or in part, for an existing DOI general applicability waiver as described at:

www.doi.gov/grants/BuyAmerica/GeneralApplicabilityWaivers. If the specific financial assistance agreement, infrastructure project, or non-domestic materials meets the criteria of an existing general applicability waiver within the limitations defined within the waiver, the recipient is not required to request a separate waiver for non-domestic materials.

If a general applicability waiver does not already apply, and a recipient believes that one of the above circumstances applies to an award, a request to waive the application of the domestic content procurement preference may be submitted to the financial assistance awarding officer in writing. Waiver requests shall include the below information. The waiver shall not include any Privacy Act information, sensitive data, or proprietary information within their waiver request. Waiver requests will be posted to www.doi.gov/grants/buyamerica and are subject to public comment periods of no less than 15 days. Waiver requests will also be reviewed by the Made in America Office.

1. Type of waiver requested (non-availability, unreasonable cost, or public interest).
2. Requesting entity and Unique Entity Identifier (UEI) submitting the request.
3. Department of Interior Bureau or Office who issued the award.
4. Federal financial assistance listing name and number (reference block 2 on DOI Notice of Award)
5. Financial assistance title of project (reference block 8 on DOI Notice of Award).
6. Federal Award Identification Number (FAIN).
7. Federal funding amount (reference block 11.m. on DO Notice of Award).
8. Total cost of Infrastructure expenditures (includes federal and non-federal funds to the extent known).
9. Infrastructure project description(s) and location(s) (to the extent known).

10. List of iron or steel item(s), manufactured goods, and construction material(s) the recipient seeks to waive from Buy America requirements. Include the name, cost, countries of origin (if known), and relevant [PSC](#) or [NAICS](#) code for each.

11. A certification that the recipient made a good faith effort to solicit bids for domestic products supported by terms included in requests for proposals, contracts, and nonproprietary communications with the prime contractor.

12. A statement of waiver justification, including a description of efforts made (e.g., market research, industry outreach) by the recipient, in an attempt to avoid the need for a waiver. Such a justification may cite, if applicable, the absence of any Buy America-compliant bids received in response to a solicitation.

13. Anticipated impact if no waiver is issued.

Approved waivers will be posted at www.doi.gov/grants/BuyAmerica/ApprovedWaivers; recipients requesting a waiver will be notified of their waiver request determination by an awarding officer.

Questions pertaining to waivers should be directed to the financial assistance awarding officer.

Definitions

“Construction materials” includes an article, material, or supply that is or consists primarily of:

- non-ferrous metals;
- plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- glass (including optic glass);
- lumber; or
- drywall.

“Construction Materials” does **not** include cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents or additives.

“Domestic content procurement preference” means all iron and steel used in the project are produced in the United States; the manufactured products used in the project are produced in the United States; or the construction materials used in the project are produced in the United States.

“Infrastructure” includes, at a minimum, the structures, facilities, and equipment for, in the United States, roads, highways, and bridges; public transportation; dams, ports, harbors, and other maritime facilities; intercity passenger and freight railroads; freight and intermodal facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property. Infrastructure includes facilities that generate, transport, and distribute energy.

“Project” means the construction, alteration, maintenance, or repair of infrastructure in the United States

II. RECLAMATION STANDARD TERMS AND CONDITIONS

1. REGULATIONS

The regulations at 2 CFR Subtitle A, Chapter II, Part 200 “Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards”, are hereby incorporated by reference as though set forth in full text. Failure of a Recipient to comply with any applicable regulation or circular may be the basis for withholding payments for proper charges made by the Recipient and/or for termination of support.

2. PAYMENT

2.1 Federal Payment (2 CFR 200.305).

- (a) For states, payments are governed by Treasury-State Cash Management Improvement Act (CMIA) agreements and default procedures codified at 31 CFR part 205 and Treasury Financial Manual (TFM) 4A-2000, “Overall Disbursing Rules for All Federal Agencies”.
- (b) For non-Federal entities other than states, payments methods must minimize the time elapsing between the transfer of funds from the United States Treasury or the pass-through entity and the disbursement by the non-Federal entity whether the payment is made by electronic funds transfer, or issuance or redemption of checks, warrants, or payment by other means. See also §200.302(b)(6). Except as noted elsewhere in this part, Federal agencies must require recipients to use only OMB-approved, governmentwide information collection requests to request payment.
 - (1) The non-Federal entity must be paid in advance, provided it maintains or demonstrates the willingness to maintain both written procedures that minimize the time elapsing between the transfer of funds and disbursement by the non-Federal entity, and financial management systems that meet the standards for fund control and accountability as established in this part. Advance payments to a non-Federal entity must be limited to the minimum amounts needed and be timed to be in accordance with the actual, immediate cash requirements of the non-Federal entity in carrying out the purpose of the approved program or project. The timing and amount of advance payments must be as close as is administratively feasible to the actual disbursements by the non-Federal entity for direct program or project costs and the proportionate share of any allowable indirect costs. The non-Federal entity must make timely payment to contractors in accordance with the contract provisions.
 - (2) Whenever possible, advance payments must be consolidated to cover anticipated cash needs for all Federal awards made by the Federal awarding agency to the recipient.
 - (i) Advance payment mechanisms include, but are not limited to, Treasury check and electronic funds transfer and must comply with applicable guidance in 31 CFR part 208.

- (ii) Non-Federal entities must be authorized to submit requests for advance payments and reimbursements at least monthly when electronic fund transfers are not used, and as often as they like when electronic transfers are used, in accordance with the provisions of the Electronic Fund Transfer Act (15 U.S.C. 1693-1693r).
- (3) Reimbursement is the preferred method when the requirements in this paragraph (b) cannot be met, when the Federal awarding agency sets a specific condition per §200.208, or when the non-Federal entity requests payment by reimbursement. This method may be used on any Federal award for construction, or if the major portion of the construction project is accomplished through private market financing or Federal loans, and the Federal award constitutes a minor portion of the project. When the reimbursement method is used, the Federal awarding agency or pass-through entity must make payment within 30 calendar days after receipt of the billing, unless the Federal awarding agency or pass-through entity reasonably believes the request to be improper.
- (4) If the non-Federal entity cannot meet the criteria for advance payments and the Federal awarding agency or pass-through entity has determined that reimbursement is not feasible because the non-Federal entity lacks sufficient working capital, the Federal awarding agency or pass-through entity may provide cash on a working capital advance basis. Under this procedure, the Federal awarding agency or pass-through entity must advance cash payments to the non-Federal entity to cover its estimated disbursement needs for an initial period generally geared to the non-Federal entity's disbursing cycle. Thereafter, the Federal awarding agency or pass-through entity must reimburse the non-Federal entity for its actual cash disbursements. Use of the working capital advance method of payment requires that the pass-through entity provide timely advance payments to any subrecipients in order to meet the subrecipient's actual cash disbursements. The working capital advance method of payment must not be used by the pass-through entity if the reason for using this method is the unwillingness or inability of the pass-through entity to provide timely advance payments to the subrecipient to meet the subrecipient's actual cash disbursements.
- (5) To the extent available, the non-Federal entity must disburse funds available from program income (including repayments to a revolving fund), rebates, refunds, contract settlements, audit recoveries, and interest earned on such funds before requesting additional cash payments.
- (6) Unless otherwise required by Federal statutes, payments for allowable costs by non-Federal entities must not be withheld at any time during the period of performance unless the conditions of §200.208, subpart D of this part, including §200.339, or one or more of the following applies:
 - (i) The non-Federal entity has failed to comply with the project objectives, Federal statutes, regulations, or the terms and conditions of the Federal award.
 - (ii) The non-Federal entity is delinquent in a debt to the United States as defined in OMB Circular A-129, "Policies for Federal Credit Programs and Non-Tax

Receivables.” Under such conditions, the Federal awarding agency or pass-through entity may, upon reasonable notice, inform the non-Federal entity that payments must not be made for financial obligations incurred after a specified date until the conditions are corrected or the indebtedness to the Federal Government is liquidated.

- (iii) A payment withheld for failure to comply with Federal award conditions, but without suspension of the Federal award, must be released to the non-Federal entity upon subsequent compliance. When a Federal award is suspended, payment adjustments will be made in accordance with §200.343.
 - (iv) A payment must not be made to a non-Federal entity for amounts that are withheld by the non-Federal entity from payment to contractors to assure satisfactory completion of work. A payment must be made when the non-Federal entity actually disburses the withheld funds to the contractors or to escrow accounts established to assure satisfactory completion of work.
- (7) Standards governing the use of banks and other institutions as depositories of advance payments under Federal awards are as follows.
- (i) The Federal awarding agency and pass-through entity must not require separate depository accounts for funds provided to a non-Federal entity or establish any eligibility requirements for depositories for funds provided to the non-Federal entity. However, the non-Federal entity must be able to account for funds received, obligated, and expended.
 - (ii) Advance payments of Federal funds must be deposited and maintained in insured accounts whenever possible.
- (8) The non-Federal entity must maintain advance payments of Federal awards in interest-bearing accounts, unless the following apply:
- (i) The non-Federal entity receives less than \$250,000 in Federal awards per year.
 - (ii) The best reasonably available interest-bearing account would not be expected to earn interest in excess of \$500 per year on Federal cash balances.
 - (iii) The depository would require an average or minimum balance so high that it would not be feasible within the expected Federal and non-Federal cash resources.
 - (iv) A foreign government or banking system prohibits or precludes interest-bearing accounts.
- (9) Interest earned amounts up to \$500 per year may be retained by the non-Federal entity for administrative expense. Any additional interest earned on Federal advance payments deposited in interest-bearing accounts must be remitted annually to the Department of Health and Human Services Payment Management System (PMS)

through an electronic medium using either Automated Clearing House (ACH) network or a Fedwire Funds Service payment.

- (i) For returning interest on Federal awards paid through PMS, the refund should:
 - (A) Provide an explanation stating that the refund is for interest;
 - (B) List the PMS Payee Account Number(s) (PANs);
 - (C) List the Federal award number(s) for which the interest was earned; and
 - (D) Make returns payable to: Department of Health and Human Services.
 - (ii) For returning interest on Federal awards not paid through PMS, the refund should:
 - (A) Provide an explanation stating that the refund is for interest;
 - (B) Include the name of the awarding agency;
 - (C) List the Federal award number(s) for which the interest was earned; and
 - (D) Make returns payable to: Department of Health and Human Services.
- (10) Funds, principal, and excess cash returns must be directed to the original Federal agency payment system. The non-Federal entity should review instructions from the original Federal agency payment system. Returns should include the following information:
- (i) Payee Account Number (PAN), if the payment originated from PMS, or Agency information to indicate whom to credit the funding if the payment originated from ASAP, NSF, or another Federal agency payment system.
 - (ii) PMS document number and subaccount(s), if the payment originated from PMS, or relevant account numbers if the payment originated from another Federal agency payment system.
 - (iii) The reason for the return (e.g., excess cash, funds not spent, interest, part interest part other, etc.)
- (11) When returning funds or interest to PMS you must include the following as applicable:
- (i) For ACH Returns:
 - Routing Number: 051036706
 - Account number: 303000
 - Bank Name and Location: Credit Gateway—ACH Receiver St. Paul, MN
 - (ii) For Fedwire Returns¹:
 - Routing Number: 021030004
 - Account number: 75010501
 - Bank Name and Location: Federal Reserve Bank Treas NYC/Funds Transfer Division New York, NY
- ¹Please note that the organization initiating payment is likely to incur a charge from their Financial Institution for this type of payment.

- (iii) For International ACH Returns:
 Beneficiary Account: Federal Reserve Bank of New York/ITS (FRBNY/ITS)
 Bank: Citibank N.A. (New York)
 Swift Code: CITIUS33
 Account Number: 36838868
 Bank Address: 388 Greenwich Street, New York, NY 10013 USA
 Payment Details (Line 70): Agency Locator Code (ALC): 75010501
 Name (abbreviated when possible) and ALC Agency POC
- (iv) For recipients that do not have electronic remittance capability, please make check² payable to: “The Department of Health and Human Services.”
 Mail Check to Treasury approved lockbox:
 HHS Program Support Center, P.O. Box 530231, Atlanta, GA 30353-0231

²Please allow 4-6 weeks for processing of a payment by check to be applied to the appropriate PMS account.
- (v) Questions can be directed to PMS at 877-614-5533 or PMSSupport@psc.hhs.gov.

2.2 Payment Method.

Recipients must utilize the Department of Treasury Automated Standard Application for Payments (ASAP) payment system to request advance or reimbursement payments. ASAP is a Recipient-initiated payment and information system designed to provide a single point of contact for the request and delivery of Federal funds. ASAP is the only allowable method for request and receipt of payment. Recipient procedures must minimize the time elapsing between the drawdown of Federal funds and the disbursement for agreement purposes.

In accordance with 2 CFR 25.200(b)(2) the Recipient shall “Maintain an active SAM registration with current information, including information on a recipient's immediate and highest level owner and subsidiaries, as well as on all predecessors that have been awarded a Federal contract or grant within the last three years, if applicable, at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency. If the Recipient allows their SAM registration to lapse, the Recipient’s accounts within ASAP will be automatically suspended by Reclamation until such time as the Recipient renews their SAM registration.

3. PROCUREMENT STANDARDS (2 CFR 200.317 through 200.327)

§200.317 Procurements by States

When procuring property and services under a Federal award, a State must follow the same policies and procedures it uses for procurements from its non-Federal funds. The State will comply with §§200.321, 200.322, and 200.323 and ensure that every purchase order or other contract includes any clauses required by §200.327. All other non-Federal entities, including subrecipients of a State, must follow the procurement standards in §§200.318 through 200.327.

§200.318 General procurement standards

- (a) The non-Federal entity must have and use documented procurement procedures, consistent with State, local, and tribal laws and regulations and the standards of this section, for the acquisition of property or services required under a Federal award or subaward. The non-Federal entity's documented procurement procedures must conform to the procurement standards identified in §§200.317 through 200.327.
- (b) Non-Federal entities must maintain oversight to ensure that contractors perform in accordance with the terms, conditions, and specifications of their contracts or purchase orders.
- (c)
 - (1) The non-Federal entity must maintain written standards of conduct covering conflicts of interest and governing the actions of its employees engaged in the selection, award and administration of contracts. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a Federal award if he or she has a real or apparent conflict of interest. Such a conflict of interest would arise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the parties indicated herein, has a financial or other interest in or a tangible personal benefit from a firm considered for a contract. The officers, employees, and agents of the non-Federal entity may neither solicit nor accept gratuities, favors, or anything of monetary value from contractors or parties to subcontracts. However, non-Federal entities may set standards for situations in which the financial interest is not substantial or the gift is an unsolicited item of nominal value. The standards of conduct must provide for disciplinary actions to be applied for violations of such standards by officers, employees, or agents of the non-Federal entity.
 - (2) If the non-Federal entity has a parent, affiliate, or subsidiary organization that is not a state, local government, or Indian tribe, the non-Federal entity must also maintain written standards of conduct covering organizational conflicts of interest. Organizational conflicts of interest means that because of relationships with a parent company, affiliate, or subsidiary organization, the non-Federal entity is unable or appears to be unable to be impartial in conducting a procurement action involving a related organization.
- (d) The non-Federal entity's procedures must avoid acquisition of unnecessary or duplicative items. Consideration should be given to consolidating or breaking out procurements to obtain a more economical purchase. Where appropriate, an analysis will be made of lease versus purchase alternatives, and any other appropriate analysis to determine the most economical approach.
- (e) To foster greater economy and efficiency, and in accordance with efforts to promote cost-effective use of shared services across the Federal Government, the non-Federal entity is encouraged to enter into state and local intergovernmental agreements or inter-entity

agreements where appropriate for procurement or use of common or shared goods and services.

- (f) The non-Federal entity is encouraged to use Federal excess and surplus property in lieu of purchasing new equipment and property whenever such use is feasible and reduces project costs.
- (g) The non-Federal entity is encouraged to use value engineering clauses in contracts for construction projects of sufficient size to offer reasonable opportunities for cost reductions. Value engineering is a systematic and creative analysis of each contract item or task to ensure that its essential function is provided at the overall lower cost.
- (h) The non-Federal entity must award contracts only to responsible contractors possessing the ability to perform successfully under the terms and conditions of a proposed procurement. Consideration will be given to such matters as contractor integrity, compliance with public policy, record of past performance, and financial and technical resources. See also §200.214.
- (i) The non-Federal entity must maintain records sufficient to detail the history of procurement. These records will include, but are not necessarily limited to the following: rationale for the method of procurement, selection of contract type, contractor selection or rejection, and the basis for the contract price.
- (j) (1) The non-Federal entity may use a time and materials type contract only after a determination that no other contract is suitable and if the contract includes a ceiling price that the contractor exceeds at its own risk. Time and materials type contract means a contract whose cost to a non-Federal entity is the sum of:
 - (i) The actual cost of materials; and
 - (ii) Direct labor hours charged at fixed hourly rates that reflect wages, general and administrative expenses, and profit.(2) Since this formula generates an open-ended contract price, a time-and-materials contract provides no positive profit incentive to the contractor for cost control or labor efficiency. Therefore, each contract must set a ceiling price that the contractor exceeds at its own risk. Further, the non-Federal entity awarding such a contract must assert a high degree of oversight in order to obtain reasonable assurance that the contractor is using efficient methods and effective cost controls.
- (k) The non-Federal entity alone must be responsible, in accordance with good administrative practice and sound business judgment, for the settlement of all contractual and administrative issues arising out of procurements. These issues include, but are not limited to, source evaluation, protests, disputes, and claims. These standards do not relieve the non-Federal entity of any contractual responsibilities under its contracts. The Federal awarding agency will not substitute its judgment for that of the non-Federal entity unless the matter is primarily a Federal concern. Violations of law will be referred to the local, state, or Federal authority having proper jurisdiction.

§200.319 Competition

- (a) All procurement transactions for the acquisition of property or services required under a Federal award must be conducted in a manner providing full and open competition consistent with the standards of this section and §200.320.
- (b) In order to ensure objective contractor performance and eliminate unfair competitive advantage, contractors that develop or draft specifications, requirements, statements of work, or invitations for bids or requests for proposals must be excluded from competing for such procurements. Some of the situations considered to be restrictive of competition include but are not limited to:
 - (1) Placing unreasonable requirements on firms in order for them to qualify to do business;
 - (2) Requiring unnecessary experience and excessive bonding;
 - (3) Noncompetitive pricing practices between firms or between affiliated companies;
 - (4) Noncompetitive contracts to consultants that are on retainer contracts;
 - (5) Organizational conflicts of interest;
 - (6) Specifying only a “brand name” product instead of allowing “an equal” product to be offered and describing the performance or other relevant requirements of the procurement; and
 - (7) Any arbitrary action in the procurement process.
- (c) The non-Federal entity must conduct procurements in a manner that prohibits the use of statutorily or administratively imposed state, local, or tribal geographical preferences in the evaluation of bids or proposals, except in those cases where applicable Federal statutes expressly mandate or encourage geographic preference. Nothing in this section preempts state licensing laws. When contracting for architectural and engineering (A/E) services, geographic location may be a selection criterion provided its application leaves an appropriate number of qualified firms, given the nature and size of the project, to compete for the contract.
- (d) The non-Federal entity must have written procedures for procurement transactions. These procedures must ensure that all solicitations:
 - (1) Incorporate a clear and accurate description of the technical requirements for the material, product, or service to be procured. Such description must not, in competitive procurements, contain features which unduly restrict competition. The description may include a statement of the qualitative nature of the material, product or service to be procured and, when necessary, must set forth those minimum essential characteristics and standards to which it must conform if it is to satisfy its intended use. Detailed product specifications should be avoided if at all possible. When it is impractical or uneconomical to make a clear and accurate description of

the technical requirements, a “brand name or equivalent” description may be used as a means to define the performance or other salient requirements of procurement. The specific features of the named brand which must be met by offers must be clearly stated; and

- (2) Identify all requirements which the offerors must fulfill and all other factors to be used in evaluating bids or proposals.
- (e) The non-Federal entity must ensure that all prequalified lists of persons, firms, or products which are used in acquiring goods and services are current and include enough qualified sources to ensure maximum open and free competition. Also, the non-Federal entity must not preclude potential bidders from qualifying during the solicitation period.
- (f) Noncompetitive procurements can only be awarded in accordance with §200.320(c).

§200.320 Methods of procurement to be followed

The non-Federal entity must have and use documented procurement procedures, consistent with the standards of this section and §§200.317, 200.318, and 200.319 for any of the following methods of procurement used for the acquisition of property or services required under a Federal award or sub-award.

- (a) Informal procurement methods. When the value of the procurement for property or services under a Federal award does not exceed the simplified acquisition threshold (SAT), as defined in §200.1, or a lower threshold established by a non-Federal entity, formal procurement methods are not required. The non-Federal entity may use informal procurement methods to expedite the completion of its transactions and minimize the associated administrative burden and cost. The informal methods used for procurement of property or services at or below the SAT include:
 - (1) Micro-purchases—(i) Distribution. The acquisition of supplies or services, the aggregate dollar amount of which does not exceed the micro-purchase threshold (See the definition of micro-purchase in §200.1). To the maximum extent practicable, the non-Federal entity should distribute micro-purchases equitably among qualified suppliers.
 - (ii) Micro-purchase awards. Micro-purchases may be awarded without soliciting competitive price or rate quotations if the non-Federal entity considers the price to be reasonable based on research, experience, purchase history or other information and documents it files accordingly. Purchase cards can be used for micro-purchases if procedures are documented and approved by the non-Federal entity.
 - (iii) Micro-purchase thresholds. The non-Federal entity is responsible for determining and documenting an appropriate micro-purchase threshold based on internal controls, an evaluation of risk, and its documented procurement procedures. The micro-purchase threshold used by the non-Federal entity must be authorized or not prohibited under State, local, or tribal laws or regulations. Non-Federal entities may

establish a threshold higher than the Federal threshold established in the Federal Acquisition Regulations (FAR) in accordance with paragraphs (a)(1)(iv) and (v) of this section.

- (iv) Non-Federal entity increase to the micro-purchase threshold up to \$50,000. Non-Federal entities may establish a threshold higher than the micro-purchase threshold identified in the FAR in accordance with the requirements of this section. The non-Federal entity may self-certify a threshold up to \$50,000 on an annual basis and must maintain documentation to be made available to the Federal awarding agency and auditors in accordance with §200.334. The self-certification must include a justification, clear identification of the threshold, and supporting documentation of any of the following:
 - (A) A qualification as a low-risk auditee, in accordance with the criteria in §200.520 for the most recent audit;
 - (B) An annual internal institutional risk assessment to identify, mitigate, and manage financial risks; or,
 - (C) For public institutions, a higher threshold consistent with State law.
 - (v) Non-Federal entity increase to the micro-purchase threshold over \$50,000. Micro-purchase thresholds higher than \$50,000 must be approved by the cognizant agency for indirect costs. The non-federal entity must submit a request with the requirements included in paragraph (a)(1)(iv) of this section. The increased threshold is valid until there is a change in status in which the justification was approved.
- (2) Small purchases—
- (i) Small purchase procedures. The acquisition of property or services, the aggregate dollar amount of which is higher than the micro-purchase threshold but does not exceed the simplified acquisition threshold. If small purchase procedures are used, price or rate quotations must be obtained from an adequate number of qualified sources as determined appropriate by the non-Federal entity.
 - (ii) Simplified acquisition thresholds. The non-Federal entity is responsible for determining an appropriate simplified acquisition threshold based on internal controls, an evaluation of risk and its documented procurement procedures which must not exceed the threshold established in the FAR. When applicable, a lower simplified acquisition threshold used by the non-Federal entity must be authorized or not prohibited under State, local, or tribal laws or regulations.
- (b) Formal procurement methods. When the value of the procurement for property or services under a Federal financial assistance award exceeds the SAT, or a lower threshold established by a non-Federal entity, formal procurement methods are required. Formal procurement methods require following documented procedures. Formal procurement methods also require public advertising unless a non-competitive procurement can be used in accordance with §200.319 or paragraph (c) of this section. The following formal methods of procurement are used for procurement of property or services above the

simplified acquisition threshold or a value below the simplified acquisition threshold the non-Federal entity determines to be appropriate:

- (1) Sealed bids. A procurement method in which bids are publicly solicited and a firm fixed-price contract (lump sum or unit price) is awarded to the responsible bidder whose bid, conforming with all the material terms and conditions of the invitation for bids, is the lowest in price. The sealed bids method is the preferred method for procuring construction, if the conditions.
 - (i) In order for sealed bidding to be feasible, the following conditions should be present:
 - (A) A complete, adequate, and realistic specification or purchase description is available;
 - (B) Two or more responsible bidders are willing and able to compete effectively for the business; and
 - (C) The procurement lends itself to a firm fixed price contract and the selection of the successful bidder can be made principally on the basis of price.
 - (ii) If sealed bids are used, the following requirements apply:
 - (A) Bids must be solicited from an adequate number of qualified sources, providing them sufficient response time prior to the date set for opening the bids, for local, and tribal governments, the invitation for bids must be publicly advertised;
 - (B) The invitation for bids, which will include any specifications and pertinent attachments, must define the items or services in order for the bidder to properly respond;
 - (C) All bids will be opened at the time and place prescribed in the invitation for bids, and for local and tribal governments, the bids must be opened publicly;
 - (D) A firm fixed price contract award will be made in writing to the lowest responsive and responsible bidder. Where specified in bidding documents, factors such as discounts, transportation cost, and life cycle costs must be considered in determining which bid is lowest. Payment discounts will only be used to determine the low bid when prior experience indicates that such discounts are usually taken advantage of; and
 - (E) Any or all bids may be rejected if there is a sound documented reason.

- (2) Proposals. A procurement method in which either a fixed price or cost-reimbursement type contract is awarded. Proposals are generally used when conditions are not appropriate for the use of sealed bids. They are awarded in accordance with the following requirements:
- (i) Requests for proposals must be publicized and identify all evaluation factors and their relative importance. Proposals must be solicited from an adequate number of qualified offerors. Any response to publicized requests for proposals must be considered to the maximum extent practical;
 - (ii) The non-Federal entity must have a written method for conducting technical evaluations of the proposals received and making selections;
 - (iii) Contracts must be awarded to the responsible offeror whose proposal is most advantageous to the non-Federal entity, with price and other factors considered; and
 - (iv) The non-Federal entity may use competitive proposal procedures for qualifications-based procurement of architectural/engineering (A/E) professional services whereby offeror's qualifications are evaluated and the most qualified offeror is selected, subject to negotiation of fair and reasonable compensation. The method, where price is not used as a selection factor, can only be used in procurement of A/E professional services. It cannot be used to purchase other types of services though A/E firms that are a potential source to perform the proposed effort.
- (c) Noncompetitive procurement. There are specific circumstances in which noncompetitive procurement can be used. Noncompetitive procurement can only be awarded if one or more of the following circumstances apply:
- (1) The acquisition of property or services, the aggregate dollar amount of which does not exceed the micro-purchase threshold (see paragraph (a)(1) of this section);
 - (2) The item is available only from a single source;
 - (3) The public exigency or emergency for the requirement will not permit a delay resulting from publicizing a competitive solicitation;
 - (4) The Federal awarding agency or pass-through entity expressly authorizes a noncompetitive procurement in response to a written request from the non-Federal entity; or
 - (5) After solicitation of a number of sources, competition is determined inadequate.

§200.321 Contracting with small and minority businesses, women's business enterprises, and labor surplus area firms

- (a) The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible.
- (b) Affirmative steps must include:
 - (1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
 - (2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
 - (3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
 - (4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
 - (5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and
 - (6) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (1) through (5) of this section.

§200.322 Domestic preferences for procurements

- (a) As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.
- (b) For purposes of this section:
 - (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
 - (2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-

based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

§200.323 Procurement of recovered materials

A non-Federal entity that is a state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

§200.324 Contract cost and price

- (a) The non-Federal entity must perform a cost or price analysis in connection with every procurement action in excess of the Simplified Acquisition Threshold including contract amendments. The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, the non-Federal entity must make independent estimates before receiving bids or proposals.
- (b) The non-Federal entity must negotiate profit as a separate element of the price for each contract in which there is no price competition and in all cases where cost analysis is performed. To establish a fair and reasonable profit, consideration must be given to the complexity of the work to be performed, the risk borne by the contractor, the contractor's investment, the amount of subcontracting, the quality of its record of past performance, and industry profit rates in the surrounding geographical area for similar work.
- (c) Costs or prices based on estimated costs for contracts under the Federal award are allowable only to the extent that costs incurred or cost estimates included in negotiated prices would be allowable for the non-Federal entity under subpart E of this part. The non-Federal entity may reference its own cost principles that comply with the Federal cost principles.
- (d) The cost plus a percentage of cost and percentage of construction cost methods of contracting must not be used.

§200.325 Federal awarding agency or pass-through entity review

- (a) The non-Federal entity must make available, upon request of the Federal awarding agency or pass-through entity, technical specifications on proposed procurements where the Federal awarding agency or pass-through entity believes such review is needed to ensure that the item or service specified is the one being proposed for acquisition. This review generally will take place prior to the time the specification is incorporated into a

solicitation document. However, if the non-Federal entity desires to have the review accomplished after a solicitation has been developed, the Federal awarding agency or pass-through entity may still review the specifications, with such review usually limited to the technical aspects of the proposed purchase.

- (b) The non-Federal entity must make available upon request, for the Federal awarding agency or pass-through entity pre-procurement review, procurement documents, such as requests for proposals or invitations for bids, or independent cost estimates, when:
 - (1) The non-Federal entity's procurement procedures or operation fails to comply with the procurement standards in this part;
 - (2) The procurement is expected to exceed the Simplified Acquisition Threshold and is to be awarded without competition or only one bid or offer is received in response to a solicitation;
 - (3) The procurement, which is expected to exceed the Simplified Acquisition Threshold, specifies a "brand name" product;
 - (4) The proposed contract is more than the Simplified Acquisition Threshold and is to be awarded to other than the apparent low bidder under a sealed bid procurement; or
 - (5) A proposed contract amendment changes the scope of a contract or increases the contract amount by more than the Simplified Acquisition Threshold.
- (c) The non-Federal entity is exempt from the pre-procurement review in paragraph (b) of this section if the Federal awarding agency or pass-through entity determines that its procurement systems comply with the standards of this part.
 - (1) The non-Federal entity may request that its procurement system be reviewed by the Federal awarding agency or pass-through entity to determine whether its system meets these standards in order for its system to be certified. Generally, these reviews must occur where there is continuous high-dollar funding, and third-party contracts are awarded on a regular basis;
 - (2) The non-Federal entity may self-certify its procurement system. Such self-certification must not limit the Federal awarding agency's right to survey the system. Under a self-certification procedure, the Federal awarding agency may rely on written assurances from the non-Federal entity that it is complying with these standards. The non-Federal entity must cite specific policies, procedures, regulations, or standards as being in compliance with these requirements and have its system available for review.

§200.326 Bonding requirements

For construction or facility improvement contracts or subcontracts exceeding the Simplified Acquisition Threshold, the Federal awarding agency or pass-through entity may accept the bonding policy and requirements of the non-Federal entity provided that the Federal awarding agency or pass-through entity has made a determination that the Federal interest is adequately

protected. If such a determination has not been made, the minimum requirements must be as follows:

- (a) A bid guarantee from each bidder equivalent to five percent of the bid price. The “bid guarantee” must consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of the bid, execute such contractual documents as may be required within the time specified.
- (b) A performance bond on the part of the contractor for 100 percent of the contract price. A “performance bond” is one executed in connection with a contract to secure fulfillment of all the contractor's requirements under such contract.
- (c) A payment bond on the part of the contractor for 100 percent of the contract price. A “payment bond” is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

§200.327 Contract provisions

The non-Federal entity's contracts must contain the applicable provisions described in Appendix II to this part.

4. EQUIPMENT (2 CFR 200.313)

See also §200.439.

- (a) Title. Subject to the obligations and conditions set forth in this section, title to equipment acquired under a Federal award will vest upon acquisition in the non-Federal entity. Unless a statute specifically authorizes the Federal agency to vest title in the non-Federal entity without further obligation to the Federal Government, and the Federal agency elects to do so, the title must be a conditional title. Title must vest in the non-Federal entity subject to the following conditions:
 - (1) Use the equipment for the authorized purposes of the project during the period of performance, or until the property is no longer needed for the purposes of the project.
 - (2) Not encumber the property without approval of the Federal awarding agency or pass-through entity.
 - (3) Use and dispose of the property in accordance with paragraphs (b), (c) and (e) of this section.
- (b) General. A state must use, manage and dispose of equipment acquired under a Federal award by the state in accordance with state laws and procedures. Other non-Federal entities must follow paragraphs (c) through (e) of this section.

(c) Use.

- (1) Equipment must be used by the non-Federal entity in the program or project for which it was acquired as long as needed, whether or not the project or program continues to be supported by the Federal award, and the non-Federal entity must not encumber the property without prior approval of the Federal awarding agency. When no longer needed for the original program or project, the equipment may be used in other activities supported by the Federal awarding agency, in the following order of priority:
 - (i) Activities under a Federal award from the Federal awarding agency which funded the original program or project, then
 - (ii) Activities under Federal awards from other Federal awarding agencies. This includes consolidated equipment for information technology systems.
 - (2) During the time that equipment is used on the project or program for which it was acquired, the non-Federal entity must also make equipment available for use on other projects or programs currently or previously supported by the Federal Government, provided that such use will not interfere with the work on the projects or program for which it was originally acquired. First preference for other use must be given to other programs or projects supported by Federal awarding agency that financed the equipment and second preference must be given to programs or projects under Federal awards from other Federal awarding agencies. Use for non-federally funded programs or projects is also permissible. User fees should be considered if appropriate.
 - (3) Notwithstanding the encouragement in §200.307 Program income to earn program income, the non-Federal entity must not use equipment acquired with the Federal award to provide services for a fee that is less than private companies charge for equivalent services unless specifically authorized by Federal statute for as long as the Federal Government retains an interest in the equipment.
 - (4) When acquiring replacement equipment, the non-Federal entity may use the equipment to be replaced as a trade-in or sell the property and use the proceeds to offset the cost of the replacement property.
- (d) Management requirements. Procedures for managing equipment (including replacement equipment), whether acquired in whole or in part under a Federal award, until disposition takes place will, as a minimum, meet the following requirements:
- (1) Property records must be maintained that include a description of the property, a serial number or other identification number, the source of funding for the property (including the FAIN), who holds title, the acquisition date, and cost of the property, percentage of Federal participation in the project costs for the Federal award under which the property was acquired, the location, use and condition of the property, and any ultimate disposition data including the date of disposal and sale price of the property.
 - (2) A physical inventory of the property must be taken and the results reconciled with the property records at least once every two years.

- (3) A control system must be developed to ensure adequate safeguards to prevent loss, damage, or theft of the property. Any loss, damage, or theft must be investigated.
 - (4) Adequate maintenance procedures must be developed to keep the property in good condition.
 - (5) If the non-Federal entity is authorized or required to sell the property, proper sales procedures must be established to ensure the highest possible return.
- (e) Disposition. When original or replacement equipment acquired under a Federal award is no longer needed for the original project or program or for other activities currently or previously supported by a Federal awarding agency, except as otherwise provided in Federal statutes, regulations, or Federal awarding agency disposition instructions, the non-Federal entity must request disposition instructions from the Federal awarding agency if required by the terms and conditions of the Federal award. Disposition of the equipment will be made as follows, in accordance with Federal awarding agency disposition instructions:
- (1) Items of equipment with a current per unit fair market value of \$5,000 or less may be retained, sold or otherwise disposed of with no further obligation to the Federal awarding agency.
 - (2) Except as provided in §200.312(b), or if the Federal awarding agency fails to provide requested disposition instructions within 120 days, items of equipment with a current per-unit fair-market value in excess of \$5,000 may be retained by the non-Federal entity or sold. The Federal awarding agency is entitled to an amount calculated by multiplying the current market value or proceeds from sale by the Federal awarding agency's percentage of participation in the cost of the original purchase. If the equipment is sold, the Federal awarding agency may permit the non-Federal entity to deduct and retain from the Federal share \$500 or ten percent of the proceeds, whichever is less, for its selling and handling expenses.
 - (3) The non-Federal entity may transfer title to the property to the Federal Government or to an eligible third party provided that, in such cases, the non-Federal entity must be entitled to compensation for its attributable percentage of the current fair market value of the property.
 - (4) In cases where a non-Federal entity fails to take appropriate disposition actions, the Federal awarding agency may direct the non-Federal entity to take disposition actions.

[78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75884, Dec. 19, 2014]

5. SUPPLIES (2 CFR 200.314)

See also §200.453.

- (a) Title to supplies will vest in the non-Federal entity upon acquisition. If there is a residual inventory of unused supplies exceeding \$5,000 in total aggregate value upon termination or completion of the project or program and the supplies are not needed for any other

Federal award, the non-Federal entity must retain the supplies for use on other activities or sell them, but must, in either case, compensate the Federal Government for its share. The amount of compensation must be computed in the same manner as for equipment. See §200.313(e)(2) for the calculation methodology.

- (b) As long as the Federal Government retains an interest in the supplies, the non-Federal entity must not use supplies acquired under a Federal award to provide services to other organizations for a fee that is less than private companies charge for equivalent services, unless specifically authorized by Federal statute.

6. INSPECTION

Reclamation has the right to inspect and evaluate the work performed or being performed under this Agreement, and the premises where the work is being performed, at all reasonable times and in a manner that will not unduly delay the work. If Reclamation performs inspection or evaluation on the premises of the Recipient or a sub-Recipient, the Recipient shall furnish and shall require sub-recipients to furnish all reasonable facilities and assistance for the safe and convenient performance of these duties

7. AUDIT REQUIREMENTS (2 CFR 200.501)

- (a) Audit required. A non-Federal entity that expends \$750,000 or more during the non-Federal entity's fiscal year in Federal awards must have a single or program-specific audit conducted for that year in accordance with the provisions of this part.
- (b) Single audit. A non-Federal entity that expends \$750,000 or more during the non-Federal entity's fiscal year in Federal awards must have a single audit conducted in accordance with §200.514 except when it elects to have a program-specific audit conducted in accordance with paragraph (c) of this section.
- (c) Program-specific audit election. When an auditee expends Federal awards under only one Federal program (excluding R&D) and the Federal program's statutes, regulations, or the terms and conditions of the Federal award do not require a financial statement audit of the auditee, the auditee may elect to have a program-specific audit conducted in accordance with §200.507. A program-specific audit may not be elected for R&D unless all of the Federal awards expended were received from the same Federal agency, or the same Federal agency and the same pass-through entity, and that Federal agency, or pass-through entity in the case of a subrecipient, approves in advance a program-specific audit.
- (d) Exemption when Federal awards expended are less than \$750,000. A non-Federal entity that expends less than \$750,000 during the non-Federal entity's fiscal year in Federal awards is exempt from Federal audit requirements for that year, except as noted in

§200.503, but records must be available for review or audit by appropriate officials of the Federal agency, pass-through entity, and Government Accountability Office (GAO).

- (e) Federally Funded Research and Development Centers (FFRDC). Management of an auditee that owns or operates a FFRDC may elect to treat the FFRDC as a separate entity for purposes of this part.
- (f) Subrecipients and Contractors. An auditee may simultaneously be a recipient, a subrecipient, and a contractor. Federal awards expended as a recipient or a subrecipient are subject to audit under this part. The payments received for goods or services provided as a contractor are not Federal awards. Section §200.330 sets forth the considerations in determining whether payments constitute a Federal award or a payment for goods or services provided as a contractor.
- (g) Compliance responsibility for contractors. In most cases, the auditee's compliance responsibility for contractors is only to ensure that the procurement, receipt, and payment for goods and services comply with Federal statutes, regulations, and the terms and conditions of Federal awards. Federal award compliance requirements normally do not pass through to contractors. However, the auditee is responsible for ensuring compliance for procurement transactions which are structured such that the contractor is responsible for program compliance or the contractor's records must be reviewed to determine program compliance. Also, when these procurement transactions relate to a major program, the scope of the audit must include determining whether these transactions are in compliance with Federal statutes, regulations, and the terms and conditions of Federal awards.
- (h) For-profit subrecipient. Since this part does not apply to for-profit subrecipients, the pass-through entity is responsible for establishing requirements, as necessary, to ensure compliance by for-profit subrecipients. The agreement with the for-profit subrecipient must describe applicable compliance requirements and the for-profit subrecipient's compliance responsibility. Methods to ensure compliance for Federal awards made to for-profit subrecipients may include pre-award audits, monitoring during the agreement, and post-award audits. See also §200.332.

[78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75887, Dec. 19, 2014; 85 FR 49571, Aug 13, 2020]

8. REMEDIES FOR NONCOMPLIANCE (2 CFR 200.339)

§200.339 Remedies for noncompliance

If a non-Federal entity fails to comply with Federal statutes, regulations or the terms and conditions of a Federal award, the Federal awarding agency or pass-through entity may impose additional conditions, as described in §200.208. If the Federal awarding agency or pass-through entity determines that noncompliance cannot be remedied by imposing additional conditions, the

Federal awarding agency or pass-through entity may take one or more of the following actions, as appropriate in the circumstances.

- (a) Temporarily withhold cash payments pending correction of the deficiency by the non-Federal entity or more severe enforcement action by the Federal awarding agency or pass-through entity.
- (b) Disallow (that is, deny both use of funds and any applicable matching credit for) all or part of the cost of the activity or action not in compliance.
- (c) Wholly or partly suspend or terminate the Federal award.
- (d) Initiate suspension or debarment proceedings as authorized under 2 CFR part 180 and Federal awarding agency regulations (or in the case of a pass-through entity, recommend such a proceeding be initiated by a Federal awarding agency).
- (e) Withhold further Federal awards for the project or program.
- (f) Take other remedies that may be legally available.

9. TERMINATION (2 CFR 200.340)

§200.340 Termination.

- (a) The Federal award may be terminated in whole or in part as follows:
 - (1) By the Federal awarding agency or pass-through entity, if a non-Federal entity fails to comply with the terms and conditions of a Federal award;
 - (2) By the Federal awarding agency or pass-through entity, to the greatest extent authorized by law, if an award no longer effectuates the program goals or agency priorities;
 - (3) By the Federal awarding agency or pass-through entity with the consent of the non-Federal entity, in which case the two parties must agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated;
 - (4) By the non-Federal entity upon sending to the Federal awarding agency or pass-through entity written notification setting forth the reasons for such termination, the effective date, and, in the case of partial termination, the portion to be terminated. However, if the Federal awarding agency or pass-through entity determines in the case of partial termination that the reduced or modified portion of the Federal award or subaward will not accomplish the purposes for which the Federal award was made, the Federal awarding agency or pass-through entity may terminate the Federal award in its entirety; or

- (5) By the Federal awarding agency or pass-through entity pursuant to termination provisions included in the Federal award.
- (b) A Federal awarding agency should clearly and unambiguously specify termination provisions applicable to each Federal award, in applicable regulations or in the award, consistent with this section.
- (c) When a Federal awarding agency terminates a Federal award prior to the end of the period of performance due to the non-Federal entity's material failure to comply with the Federal award terms and conditions, the Federal awarding agency must report the termination to the OMB-designated integrity and performance system accessible through SAM (currently FAPIIS).
 - (1) The information required under paragraph (c) of this section is not to be reported to designated integrity and performance system until the non-Federal entity either—
 - (i) Has exhausted its opportunities to object or challenge the decision, see §200.342; or
 - (ii) Has not, within 30 calendar days after being notified of the termination, informed the Federal awarding agency that it intends to appeal the Federal awarding agency's decision to terminate.
 - (2) If a Federal awarding agency, after entering information into the designated integrity and performance system about a termination, subsequently:
 - (i) Learns that any of that information is erroneous, the Federal awarding agency must correct the information in the system within three business days;
 - (ii) Obtains an update to that information that could be helpful to other Federal awarding agencies, the Federal awarding agency is strongly encouraged to amend the information in the system to incorporate the update in a timely way.
 - (3) Federal awarding agencies, must not post any information that will be made publicly available in the non-public segment of designated integrity and performance system that is covered by a disclosure exemption under the Freedom of Information Act. If the non-Federal entity asserts within seven calendar days to the Federal awarding agency who posted the information, that some of the information made publicly available is covered by a disclosure exemption under the Freedom of Information Act, the Federal awarding agency who posted the information must remove the posting within seven calendar days of receiving the assertion. Prior to reposting the releasable information, the Federal agency must resolve the issue in accordance with the agency's Freedom of Information Act procedures.
- (d) When a Federal award is terminated or partially terminated, both the Federal awarding agency or pass-through entity and the non-Federal entity remain responsible for compliance with the requirements in §§200.344 and 200.345.

10. DEBARMENT AND SUSPENSION (2 CFR 1400)

The Department of the Interior regulations at 2 CFR 1400—Governmentwide Debarment and Suspension (Nonprocurement), which adopt the common rule for the governmentwide system of debarment and suspension for nonprocurement activities, are hereby incorporated by reference and made a part of this Agreement. By entering into this grant or cooperative Agreement with the Bureau of Reclamation, the Recipient agrees to comply with 2 CFR 1400, Subpart C, and agrees to include a similar term or condition in all lower-tier covered transactions. These regulations are available at <http://www.ecfr.gov/>.

11. DRUG-FREE WORKPLACE (2 CFR 182 and 1401)

The Department of the Interior regulations at 2 CFR 1401—Governmentwide Requirements for Drug-Free Workplace (Financial Assistance), which adopt the portion of the Drug-Free Workplace Act of 1988 (41 U.S.C. 701 et seq, as amended) applicable to grants and cooperative agreements, are hereby incorporated by reference and made a part of this agreement. By entering into this grant or cooperative agreement with the Bureau of Reclamation, the Recipient agrees to comply with 2 CFR 182.

12. ASSURANCES AND CERTIFICATIONS INCORPORATED BY REFERENCE

The provisions of the Assurances, SF-424B or SF-424D as applicable, executed by the Recipient in connection with this Agreement shall apply with full force and effect to this Agreement. All anti-discrimination and equal opportunity statutes, regulations, and Executive Orders that apply to the expenditure of funds under Federal contracts, grants, and cooperative Agreements, loans, and other forms of Federal assistance. The Recipient shall comply with Title VI or the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and any program-specific statutes with anti-discrimination requirements. The Recipient shall comply with civil rights laws including, but not limited to, the Fair Housing Act, the Fair Credit Reporting Act, the Americans with Disabilities Act, Title VII of the Civil Rights Act of 1964, the Equal Educational Opportunities Act, the Age Discrimination in Employment Act, and the Uniform Relocation Act.

Such Assurances also include, but are not limited to, the promise to comply with all applicable Federal statutes and orders relating to nondiscrimination in employment, assistance, and housing; the Hatch Act; Federal wage and hour laws and regulations and work place safety standards; Federal environmental laws and regulations and the Endangered Species Act; and Federal protection of rivers and waterways and historic and archeological preservation.

13. COVENANT AGAINST CONTINGENT FEES

The Recipient warrants that no person or agency has been employed or retained to solicit or secure this Agreement upon an Agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide offices established and maintained by the Recipient for the purpose of securing Agreements or business. For breach or

violation of this warranty, the Government shall have the right to annul this Agreement without liability or, in its discretion, to deduct from the Agreement amount, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

14. TRAFFICKING VICTIMS PROTECTION ACT OF 2000 (2 CFR 175.15)

Trafficking in persons.

(a) *Provisions applicable to a recipient that is a private entity.*

- (1) You as the recipient, your employees, subrecipients under this award, and subrecipients' employees may not
 - (i) Engage in severe forms of trafficking in persons during the period of time that the award is in effect;
 - (ii) Procure a commercial sex act during the period of time that the award is in effect; or
 - (iii) Use forced labor in the performance of the award or subawards under the award.
- (2) We as the Federal awarding agency may unilaterally terminate this award, without penalty, if you or a subrecipient that is a private entity —
 - (i) Is determined to have violated a prohibition in paragraph a.1 of this award term; or
 - (ii) Has an employee who is determined by the agency official authorized to terminate the award to have violated a prohibition in paragraph a.1 of this award term through conduct that is either:
 - (A) Associated with performance under this award; or
 - (B) Imputed to you or the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, “OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement),” as implemented by our agency at 2 CFR part 1400.

(b) *Provision applicable to a recipient other than a private entity.* We as the Federal awarding agency may unilaterally terminate this award, without penalty, if a subrecipient that is a private entity—

- (1) Is determined to have violated an applicable prohibition in paragraph a.1 of this award term; or

- (2) Has an employee who is determined by the agency official authorized to terminate the award to have violated an applicable prohibition in paragraph a.1 of this award term through conduct that is either:
 - (i) Associated with performance under this award; or
 - (ii) Imputed to the subrecipient using the standards and due process for imputing the conduct of an individual to an organization that are provided in 2 CFR part 180, “OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement),” as implemented by our agency at 2 CFR part 1400.

(c) *Provisions applicable to any recipient.*

- (1) You must inform us immediately of any information you receive from any source alleging a violation of a prohibition in paragraph a.1 of this award term.
- (2) Our right to terminate unilaterally that is described in paragraph a.2 or b of this section:
 - (i) Implements section 106(g) of the Trafficking Victims Protection Act of 2000 (TVPA), as amended (22 U.S.C. 7104(g)), and
 - (ii) Is in addition to all other remedies for noncompliance that are available to us under this award.
- (3) You must include the requirements of paragraph a.1 of this award term in any subaward you make to a private entity.

(d) *Definitions.* For purposes of this award term:

- (1) “Employee” means either:
 - (i) An individual employed by you or a subrecipient who is engaged in the performance of the project or program under this award; or
 - (ii) Another person engaged in the performance of the project or program under this award and not compensated by you including, but not limited to, a volunteer or individual whose services are contributed by a third party as an in-kind contribution toward cost sharing or matching requirements.
- (2) “Forced labor” means labor obtained by any of the following methods: the recruitment, harboring, transportation, provision, or obtaining of a person for labor or services, through the use of force, fraud, or coercion for the purpose of subjection to involuntary servitude, peonage, debt bondage, or slavery.

(3) “Private entity”:

(i) Means any entity other than a state, local government, Indian tribe, or foreign public entity, as those terms are defined in 2 CFR 175.25.

(ii) Includes:

(A) A nonprofit organization, including any nonprofit institution of higher education, hospital, or tribal organization other than one included in the definition of Indian tribe at 2 CFR 175.25(b).

(B) A for-profit organization.

(4) “Severe forms of trafficking in persons,” “commercial sex act,” and “coercion” have the meanings given at section 103 of the TVPA, as amended (22 U.S.C. 7102).

15. NEW RESTRICTIONS ON LOBBYING (43 CFR 18)

The Recipient agrees to comply with 43 CFR 18, New Restrictions on Lobbying, including the following certification:

- (a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Recipient, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying” in accordance with its instructions.
- (c) The Recipient shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification

shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

16. UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT OF 1970 (URA) (42 USC 4601 *et seq.*)

- (a) The Uniform Relocation Assistance Act (URA), 42 U.S.C. 4601 *et seq.*, as amended, requires certain assurances for Reclamation funded land acquisition projects conducted by a Recipient that cause the displacement of persons, businesses, or farm operations. Because Reclamation funds only support acquisition of property or interests in property from willing sellers, it is not anticipated that Reclamation funds will result in any “displaced persons,” as defined under the URA.
- (b) However, if Reclamation funds are used for the acquisition of real property that results in displacement, the URA requires Recipients to ensure that reasonable relocation payments and other remedies will be provided to any displaced person. Further, when acquiring real property, Recipients must be guided, to the greatest extent practicable, by the land acquisition policies in 42 U.S.C. 4651.
- (c) Exemptions to the URA and 49 CFR Part 24
 - (1) The URA provides for an exemption to the appraisal, review and certification rules for those land acquisitions classified as “voluntary transactions.” Such “voluntary transactions” are classified as those that do not involve an exercise of eminent domain authority on behalf of a Recipient, and must meet the conditions specified at 49 CFR 24.101(b)(1)(i)-(iv).
 - (2) For any land acquisition undertaken by a Recipient that receives Reclamation funds, but does not have authority to acquire the real property by eminent domain, to be exempt from the requirements of 49 CFR Part 24 the Recipient must:
 - (i) provide written notification to the owner that it will not acquire the property in the event negotiations fail to result in an amicable agreement, and;
 - (ii) inform the owner in writing of what it believes to be the market value of the property.
- (d) Review of Land Acquisition Appraisals. Reclamation reserves the right to review any land appraisal whether or not such review is required under the URA or 49 CFR 24.104. Such reviews may be conducted by the Department of the Interior’s Appraisal Services Directorate or a Reclamation authorized designee. When Reclamation determines that a review of the original appraisal is necessary, Reclamation will notify the Recipient and provide an estimated completion date of the initial appraisal review.

17. SYSTEM FOR AWARD MANAGEMENT AND UNIVERSAL IDENTIFIER REQUIREMENTS (2 CFR 25, APPENDIX A)

A. Requirement for System for Award Management

Unless you are exempted from this requirement under 2 CFR 25.110, you as the recipient must maintain the currency of your information in the SAM until you submit the final financial report required under this award or receive the final payment, whichever is later. This requires that you review and update the information at least annually after the initial registration, and more frequently if required by changes in your information or another award term.

B. Requirement for unique entity identifier

If you are authorized to make subawards under this award, you:

1. Must notify potential subrecipients that no entity (see definition in paragraph C of this award term) may receive a subaward from you unless the entity has provided its unique entity identifier to you.
2. May not make a subaward to an entity unless the entity has provided its unique entity identifier to you.

C. Definitions

For purposes of this award term:

1. System for Award Management (SAM) means the Federal repository into which an entity must provide information required for the conduct of business as a recipient. Additional information about registration procedures may be found at the SAM Internet site (currently at <http://www.sam.gov>).
2. Unique entity identifier means the identifier required for SAM registration to uniquely identify business entities.
3. Entity, as it is used in this award term, means all of the following, as defined at 2 CFR part 25, subpart C:
 - a. A Governmental organization, which is a State, local government, or Indian Tribe;
 - b. A foreign public entity;
 - c. A domestic or foreign nonprofit organization;
 - d. A domestic or foreign for-profit organization; and

- e. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.
4. Subaward:
- a. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.
 - b. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see 2 CFR 200.330).
 - c. A subaward may be provided through any legal agreement, including an agreement that you consider a contract.
5. Subrecipient means an entity that:
- a. Receives a subaward from you under this award; and
 - b. Is accountable to you for the use of the Federal funds provided by the subaward.

18. PROHIBITION ON TEXT MESSAGING AND USING ELECTRONIC EQUIPMENT SUPPLIED BY THE GOVERNMENT WHILE DRIVING

Executive Order 13513, *Federal Leadership On Reducing Text Messaging While Driving*, was signed by President Barack Obama on October 1, 2009 (ref: <http://edocket.access.gpo.gov/2009/pdf/E9-24203.pdf>). This Executive Order introduces a Federal Government-wide prohibition on the use of text messaging while driving on official business or while using Government-supplied equipment. Additional guidance enforcing the ban will be issued at a later date. In the meantime, please adopt and enforce policies that immediately ban text messaging while driving company-owned or rented vehicles, government-owned or leased vehicles, or while driving privately owned vehicles when on official government business or when performing any work for or on behalf of the government.

19. REPORTING SUBAWARDS AND EXECUTIVE COMPENSATION (2 CFR 170 APPENDIX A)

I. Reporting Subawards and Executive Compensation.

- a. Reporting of first-tier subawards.
 - 1. Applicability. Unless you are exempt as provided in paragraph d. of this award term, you must report each action that obligates \$25,000 or more in Federal funds that does not include Recovery funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5) for a subaward to an entity (see definitions in paragraph e. of this award term).

2. Where and when to report.
 - i. You must report each obligating action described in paragraph a.1. of this award term to <http://www.fsrs.gov>.
 - ii. For subaward information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)
 3. What to report. You must report the information about each obligating action that the submission instructions posted at <http://www.fsrs.gov> specify.
- b. Reporting Total Compensation of Recipient Executives.
1. Applicability and what to report. You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if—
 - i. the total Federal funding authorized to date under this award is \$25,000 or more;
 - ii. in the preceding fiscal year, you received—
 - (A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and
 - (B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and
 - iii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)
 2. Where and when to report. You must report executive total compensation described in paragraph b.1. of this award term:
 - i. As part of your registration profile at <http://www.ccr.gov>.

- ii. By the end of the month following the month in which this award is made, and annually thereafter.
- c. Reporting of Total Compensation of Subrecipient Executives.
- 1. Applicability and what to report. Unless you are exempt as provided in paragraph d. of this award term, for each first-tier subrecipient under this award, you shall report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if—
 - i. in the subrecipient's preceding fiscal year, the subrecipient received—
 - (A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and
 - (B) \$25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and
 - ii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at <http://www.sec.gov/answers/execomp.htm>.)
 - 2. Where and when to report. You must report subrecipient executive total compensation described in paragraph c.1. of this award term:
 - i. To the recipient.
 - ii. By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (i.e., between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. Exemptions

If, in the previous tax year, you had gross income, from all sources, under \$300,000, you are exempt from the requirements to report:

- i. Subawards, and
- ii. The total compensation of the five most highly compensated executives of any subrecipient.

e. Definitions. For purposes of this award term:

1. Entity means all of the following, as defined in 2 CFR part 25:
 - i. A Governmental organization, which is a State, local government, or Indian tribe;
 - ii. A foreign public entity;
 - iii. A domestic or foreign nonprofit organization;
 - iv. A domestic or foreign for-profit organization;
 - v. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.
2. Executive means officers, managing partners, or any other employees in management positions.
3. Subaward:
 - i. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.
 - ii. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. __.210 of the attachment to OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations").
 - iii. A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.

4. *Subrecipient* means an entity that:
 - i. Receives a subaward from you (the recipient) under this award; and
 - ii. Is accountable to you for the use of the Federal funds provided by the subaward.
5. *Total compensation* means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):
 - i. *Salary and bonus.*
 - ii. *Awards of stock, stock options, and stock appreciation rights.* Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.
 - iii. *Earnings for services under non-equity incentive plans.* This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.
 - iv. *Change in pension value.* This is the change in present value of defined benefit and actuarial pension plans.
 - v. *Above-market earnings on deferred compensation which is not tax-qualified.*
 - vi. Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds \$10,000.

20. RECIPIENT EMPLOYEE WHISTLEBLOWER RIGHTS AND REQUIREMENT TO INFORM EMPLOYEES OF WHISTLEBLOWER RIGHTS (SEP 2013)

- (a) This award and employees working on this financial assistance agreement will be subject to the whistleblower rights and remedies in the pilot program on Award Recipient employee whistleblower protections established at 41 U.S.C. 4712 by section 828 of the National Defense Authorization Act for Fiscal Year 2013 (Pub. L. 112-239).
- (b) The Award Recipient shall inform its employees in writing, in the predominant language of the workforce, of employee whistleblower rights and protections under 41 U.S.C 4712.

- (c) The Award Recipient shall insert the substance of this clause, including this paragraph (c), in all subawards or subcontracts over the simplified acquisition threshold. 48 CFR 52.203-17 (as referenced in 48 CFR 3.908-9).

21. REPORTING OF MATTERS RELATED TO RECIPIENT INTEGRITY AND PERFORMANCE (APPENDIX XII TO 2 CFR PART 200)

1. General Reporting Requirement

If the total value of your currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds \$10,000,000 for any period of time during the period of performance of this Federal award, then you as the recipient during that period of time must maintain the currency of information reported to the System for Award Management (SAM) that is made available in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System (FAPIIS)) about civil, criminal, or administrative proceedings described in paragraph 2 of this award term and condition. This is a statutory requirement under section 872 of Public Law 110-417, as amended (41 U.S.C. 2313). As required by section 3010 of Public Law 111-212, all information posted in the designated integrity and performance system on or after April 15, 2011, except past performance reviews required for Federal procurement contracts, will be publicly available.

2. Proceedings About Which You Must Report

Submit the information required about each proceeding that:

- a. Is in connection with the award or performance of a grant, cooperative agreement, or procurement contract from the Federal Government;
- b. Reached its final disposition during the most recent five-year period; and
- c. Is one of the following:
 - (1) A criminal proceeding that resulted in a conviction, as defined in paragraph 5 of this award term and condition;
 - (2) A civil proceeding that resulted in a finding of fault and liability and payment of a monetary fine, penalty, reimbursement, restitution, or damages of \$5,000 or more;
 - (3) An administrative proceeding, as defined in paragraph 5. of this award term and condition, that resulted in a finding of fault and liability and your payment of either a monetary fine or penalty of \$5,000 or more or reimbursement, restitution, or damages in excess of \$100,000; or
 - (4) Any other criminal, civil, or administrative proceeding if:
 - (i) It could have led to an outcome described in paragraph 2.c.(1), (2), or (3) of this award term and condition;
 - (ii) It had a different disposition arrived at by consent or compromise with an acknowledgment of fault on your part; and

- (iii) The requirement in this award term and condition to disclose information about the proceeding does not conflict with applicable laws and regulations.

3. Reporting Procedures

Enter in the SAM Entity Management area the information that SAM requires about each proceeding described in paragraph 2 of this award term and condition. You do not need to submit the information a second time under assistance awards that you received if you already provided the information through SAM because you were required to do so under Federal procurement contracts that you were awarded.

4. Reporting Frequency

During any period of time when you are subject to the requirement in paragraph 1 of this award term and condition, you must report proceedings information through SAM for the most recent five year period, either to report new information about any proceeding(s) that you have not reported previously or affirm that there is no new information to report. Recipients that have Federal contract, grant, and cooperative agreement awards with a cumulative total value greater than \$10,000,000 must disclose semiannually any information about the criminal, civil, and administrative proceedings.

5. Definitions

For purposes of this award term and condition:

- a. Administrative proceeding means a non-judicial process that is adjudicatory in nature in order to make a determination of fault or liability (e.g., Securities and Exchange Commission Administrative proceedings, Civilian Board of Contract Appeals proceedings, and Armed Services Board of Contract Appeals proceedings). This includes proceedings at the Federal and State level but only in connection with performance of a Federal contract or grant. It does not include audits, site visits, corrective plans, or inspection of deliverables.
- b. Conviction, for purposes of this award term and condition, means a judgment or conviction of a criminal offense by any court of competent jurisdiction, whether entered upon a verdict or a plea, and includes a conviction entered upon a plea of nolo contendere.
- c. Total value of currently active grants, cooperative agreements, and procurement contracts includes—
 - (1) Only the Federal share of the funding under any Federal award with a recipient cost share or match; and
 - (2) The value of all expected funding increments under a Federal award and options, even if not yet exercised.

[80 FR 43310, July 22, 2015, as amended at 85 FR 49582, Aug. 13, 2020]

22. CONFLICTS OF INTEREST

(a) Applicability.

- (1) This section intends to ensure that non-Federal entities and their employees take appropriate steps to avoid conflicts of interest in their responsibilities under or with respect to Federal financial assistance agreements.
- (2) In the procurement of supplies, equipment, construction, and services by recipients and by subrecipients, the conflict of interest provisions in 2 CFR 200.318 apply.

(b) Requirements.

- (1) Non-Federal entities must avoid prohibited conflicts of interest, including any significant financial interests that could cause a reasonable person to question the recipient's ability to provide impartial, technically sound, and objective performance under or with respect to a Federal financial assistance agreement.
- (2) In addition to any other prohibitions that may apply with respect to conflicts of interest, no key official of an actual or proposed recipient or subrecipient, who is substantially involved in the proposal or project, may have been a former Federal employee who, within the last one (1) year, participated personally and substantially in the evaluation, award, or administration of an award with respect to that recipient or subrecipient or in development of the requirement leading to the funding announcement.
- (3) No actual or prospective recipient or subrecipient may solicit, obtain, or use non-public information regarding the evaluation, award, or administration of an award to that recipient or subrecipient or the development of a Federal financial assistance opportunity that may be of competitive interest to that recipient or subrecipient.

(c) Notification.

- (1) Non-Federal entities, including applicants for financial assistance awards, must disclose in writing any conflict of interest to the DOI awarding agency or pass-through entity in accordance with 2 CFR 200.112, Conflict of Interest.
- (2) Recipients must establish internal controls that include, at a minimum, procedures to identify, disclose, and mitigate or eliminate identified conflicts of interest. The recipient is responsible for notifying the Financial Assistance Officer in writing of any conflicts of interest that may arise during the life of the award, including those that have been reported by subrecipients.

(d) Restrictions on Lobbying. Non-Federal entities are strictly prohibited from using funds under this grant or cooperative agreement for lobbying activities and must provide the required certifications and disclosures pursuant to 43 CFR Part 18 and 31 USC 1352.

(e) Review Procedures. The Financial Assistance Officer will examine each conflict of interest disclosure on the basis of its particular facts and the nature of the proposed grant or cooperative agreement, and will determine whether a significant potential conflict exists and, if it does, develop an appropriate means for resolving it.

(f) Enforcement. Failure to resolve conflicts of interest in a manner that satisfies the Government may be cause for termination of the award. Failure to make required disclosures may result in any of the remedies described in 2 CFR 200.339, Remedies for Noncompliance, including suspension or debarment (see also 2 CFR Part 180).

23. DATA AVAILABILITY

(a) Applicability. The Department of the Interior is committed to basing its decisions on the best available science and providing the American people with enough information to thoughtfully and substantively evaluate the data, methodology, and analysis used by the Department to inform its decisions.

(b) Use of Data. The regulations at 2 CFR 200.315 apply to data produced under a Federal award, including the provision that the Federal Government has the right to obtain, reproduce, publish, or otherwise use the data produced under a Federal award as well as authorize others to receive, reproduce, publish, or otherwise use such data for Federal purposes.

(c) Availability of Data. The recipient shall make the data produced under this award and any subaward(s) available to the Government for public release, consistent with applicable law, to allow meaningful third-party evaluation and reproduction of the following:

- (i) The scientific data relied upon;
- (ii) The analysis relied upon; and
- (iii) The methodology, including models, used to gather and analyze data.

24. PROHIBITION ON PROVIDING FUNDS TO THE ENEMY

- (a) The recipient must—
 - (1) Exercise due diligence to ensure that none of the funds, including supplies and services, received under this grant or cooperative agreement are provided directly or indirectly (including through subawards or contracts) to a person or entity who is actively opposing the United States or coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities, which must be completed through [2 CFR 180.300](#) prior to issuing a subaward or contract and;
 - (2) Terminate or void in whole or in part any subaward or contract with a person or entity listed in SAM as a prohibited or restricted source pursuant to subtitle E of

Title VIII of the NDAA for FY 2015, unless the Federal awarding agency provides written approval to continue the subaward or contract.

- (b) The recipient may include the substance of this clause, including paragraph (a) of this clause, in subawards under this grant or cooperative agreement that have an estimated value over \$50,000 and will be performed outside the United States, including its outlying areas.
- (c) The Federal awarding agency has the authority to terminate or void this grant or cooperative agreement, in whole or in part, if the Federal awarding agency becomes aware that the recipient failed to exercise due diligence as required by paragraph (a) of this clause or if the Federal awarding agency becomes aware that any funds received under this grant or cooperative agreement have been provided directly or indirectly to a person or entity who is actively opposing coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities.

25. ADDITIONAL ACCESS TO RECIPIENT RECORDS

- (a) In addition to any other existing examination-of-records authority, the Federal Government is authorized to examine any records of the recipient and its subawards or contracts to the extent necessary to ensure that funds, including supplies and services, available under this grant or cooperative agreement are not provided, directly or indirectly, to a person or entity that is actively opposing United States or coalition forces involved in a contingency operation in which members of the Armed Forces are actively engaged in hostilities, except for awards awarded by the Department of Defense on or before Dec 19, 2017 that will be performed in the United States Central Command (USCENTCOM) theater of operations.
- (b) The substance of this clause, including this paragraph (b), is required to be included in subawards or contracts under this grant or cooperative agreement that have an estimated value over \$50,000 and will be performed outside the United States, including its outlying areas.

26. PROHIBITION ON CERTAIN TELECOMMUNICATION AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

Federal award recipients are prohibited from using government funds to enter contracts (or extend or renew contracts) with entities that use covered telecommunications equipment or services as described in section 889 of the 2019 National Defense Authorization Act. This prohibition applies even if the contract is not intended to procure or obtain, any equipment, system, or service that uses covered telecommunications equipment or services.

III. DEPARTMENT OF THE INTERIOR STANDARD AWARD TERMS AND CONDITIONS

The Department of the Interior (DOI) Standard Award Terms and Conditions found at <https://www.doi.gov/sites/doi.gov/files/uploads/doi-standard-award-terms-and-conditions-effective-december-2-2019-revised-june-19-2020.pdf> are hereby incorporated by reference as though set forth in full text. These terms and conditions are in addition to the assurances and certifications made as part of the award and terms, conditions or restrictions reflected on this Agreement. Recipient acceptance of this Agreement carries with it the responsibility to be aware of and comply with all DOI terms and conditions applicable to this Agreement. The Recipient is responsible for ensuring their subrecipients and contractors are aware of and comply with applicable statutes, regulations, and agency requirements.

Recipient and subrecipient failure to comply with the general terms and conditions outlined below and those directly reflected in this Agreement can result in the DOI taking one or more of remedies described in 2 Code of Federal Regulations parts 200.339 and 200.340. The DOI will notify the Recipient whenever terms and conditions are updated to accommodate instances in the passage of a regulation or statute that requires compliance. Also, DOI will inform the Recipient of revised terms and conditions in the action of an Agreement amendment adding additional Federal funds. Reclamation will make such changes by issuing a Notice of Award amendment that describes the change and provides the effective date. Revised terms and conditions do not apply to the Recipient's expenditures of funds or activities the Recipient carries out before the effective date of the revised DOI terms and conditions.

File Attachments for Item:

14. CONSIDERATION OF GRANTING, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF EASEMENT E-2223-24: GRANTING AN EASEMENT TO OKLAHOMA GAS AND ELECTRIC COMPANY TO PROVIDE ELECTRICAL SERVICE TO THE NEW YOUNG FAMILY ATHLETIC CENTER LOCATED EAST OF 24TH AVENUE N.W. AND SOUTH OF ROCK CREEK ROAD.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Kathryn Walker, City Attorney

PRESENTER: Kathryn Walker, City Attorney

ITEM TITLE: CONSIDERATION OF GRANTING, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF EASEMENT E-2223-24: GRANTING AN EASEMENT TO OKLAHOMA GAS AND ELECTRIC COMPANY TO PROVIDE ELECTRICAL SERVICE TO THE NEW YOUNG FAMILY ATHLETIC CENTER LOCATED EAST OF 24TH AVENUE N.W. AND SOUTH OF ROCK CREEK ROAD.

BACKGROUND:

In October of 2015, Norman citizens passed the Norman Forward Initiative, funding various projects through a ½% sales tax increase over 15 years. Included in the Norman Forward Initiative were projects to construct a new Multi-Sport Complex and Indoor Aquatic Facility.

The Multi-Sport Complex and Indoor Aquatic Facility were initially proposed as two separate projects. After extensive public input and consideration by the City Council, acting as Trustees of the Norman Municipal Authority (NMA), these projects were combined into one more extensive project in 2018, located at the corner of 24th Avenue NW and Rock Creek Road. This new sports and aquatic complex will include eight full-sized basketball or 12 volleyball courts; a 25-meter, eight-lane lap pool; a 25-yard, four-lane warm-up pool; concession stands; retail space; administration offices; and, through a partnership with Norman Regional Health System (NRHS), a health and wellness clinic to be placed between the multi-sports and aquatic complexes.

Oklahoma City firm Frankfurt, Short, Bruza (FSB) was selected as the architectural and engineering (A/E) consultant for this project in March 2018. FSB has completed the schematic design and design development documents phase of the project and is proceeding with construction documents and assisting with construction administration through the project completion. The building and the project were named the Young Family Athletic Center (YFAC) in July of 2021 (Contract K-2122-27) after the Trae Young Family Foundation (TYFF) agreed to donate \$4,000,000 to the construction of the building.

DISCUSSION:

In order to provide electrical service to the new facility, Oklahoma Gas and Electric requires an easement to allow for sufficient working areas to operate, maintain, repair or replace their facilities. The proposed easement is 10 feet in width and will provide sufficient working area without impacting the site. The Architect of Record, FSB, has reviewed the easement documents and they have deemed the requested easement to be reasonable and acceptable.

RECOMMENDATION:

Staff recommends granting of Easement E-2223-24 to Oklahoma Gas and Electric in order to provide necessary electrical service to the new Young Family Athletic Center east of 24th Ave NW and south of Rock Creek Road.



FEBRUARY 6, 2022

CITY OF NORMAN
ATTN: JASON OLSEN
P. O. BOX 370
NORMAN, OK. 73069

RE: Easement for underground lines to serve the Young Family Athletic Center

Mr. Olsen;

Oklahoma Gas and Electric Company (OG&E) has been asked to provide electrical service to the new Young Family Athletic Center being built east of 24th Avenue NW and south of Rock Creek Road. Attached you will find an easement request for the new underground lines. The description of the proposed lines appears on Exhibit "A", and a drawing showing the pathway of the lines appear on Exhibit "B". I have also included a copy of the engineer's design. Please note, this is not part of the easement document.

Please present this document at your next City Council meeting for signature. Review the following instructions to ensure that this easement will be legally correct and that there will be no delay in processing:

1. The **city seal** must be affixed.
2. The **date of signing** must match the **date of notarizing**.
3. The notary must fill in **all blanks** in the acknowledgement section and add the **notary seal**.
4. The **notary expiration date** must be later than the **date of notarizing**.

Please contact when the document has been dated, signed, and notarized, and I will come by and pick it up. If you have any questions, or if anything will cause a delay in signing, please contact me at (405) 553-5174. Thank you so much for your help in this matter.

Sincerely,

A handwritten signature in black ink that reads "Timothy J. Bailey". The signature is fluid and cursive.

Timothy J. Bailey
Right-Of-Way Agent

AFTER RECORDING RETURN TO:
 OGE ELECTRIC SERVICES
 TIMOTHY J. BAILEY, M/C WNM-12
 PO BOX 321
 OKLAHOMA CITY OK 73101-0321

EASEMENT

Work Order #7708969

KNOW ALL MEN BY THESE PRESENTS: THAT **THE CITY OF NORMAN, OKLAHOMA, an Oklahoma municipal corporation**, Grantor, in consideration of the sum of Ten or more dollars in hand paid, the receipt of which is hereby acknowledged, and other good and valuable consideration, does hereby grant and warrant unto **OKLAHOMA GAS AND ELECTRIC COMPANY**, an Oklahoma corporation, Grantee, its successors and assigns, the right, privilege and authority to enter upon and install, erect, operate, maintain, and reconstruct underground and/or above ground a system of conduits, wires, cables, vaults, junction boxes, switches, fuses, transformers, service connection boxes and other fixtures for the transmission and distribution of electrical current and communication messages, including the right of ingress and egress to and from said system across adjoining lands of Grantor, upon and across the following real property and premises, situated in Cleveland County, State of Oklahoma, to wit:

A part of the **NE/4 OF SECTION 23 AND THE NW/4 OF SECTION 24, T9N, R3W, I.M.**, being a part of a tract of land described in deed recorded in Book 6266, Pages 1413-1421, at the County Clerk's office, as described in Exhibit "A" and shown on Exhibit "B", attached hereto and hereby made a part of this easement.

Grantor further covenants and agrees that no building or other structure shall ever be erected nor shall any excavation or other removal of soil, so as to change the grade of terrain, be accomplished by Grantor, its heirs or assigns, within the above described easement area unless the written consent of the Grantee is first obtained. Grantor further acknowledges the requirements of 63 Oklahoma Statutes (2011) Section 142.1, et. seq. (One-call statute).

The rights and privileges above granted to continue so long as same are used or needed for the transmission and distribution of electric current or communication messages; but should the Grantee remove its property from the premises and abandon the right of way herein granted, then the rights granted in this easement shall terminate.

Approved this _____ day of _____, 2023, by the City of Norman.

THE CITY OF NORMAN, OKLAHOMA, an Oklahoma municipal corporation

City Seal

By: _____

Title: _____

CITY ACKNOWLEDGMENT

STATE OF OKLAHOMA, COUNTY OF CLEVELAND, SS;

Before me, the undersigned, a Notary Public, in and for said County and State, on this _____ day of _____, 2023, personally appeared _____, of the City of Norman, Oklahoma, an Oklahoma municipal corporation, to me known to be the identical person who subscribed the name of the maker thereof to the foregoing instrument as its _____, and acknowledged to me that he executed the same as his free and voluntary act and deed of such city, for the uses and purposes therein set forth.

My Commission Expires: _____

Commission # _____

Notary Public

EXHIBIT "A"

To that certain easement from the City of Norman, Oklahoma, an Oklahoma municipal corporation to Oklahoma Gas and Electric Company.

An easement in the **NORTHWEST QUARTER (NW1/4) OF SECTION TWENTY-FOUR (24), AND THE NORTHEAST QUARTER (NE1/4) SECTION TWENTY-THREE (23), TOWNSHIP NINE (9) NORTH, RANGE THREE (3) WEST** of the Indian Meridian, Cleveland County, Oklahoma, written by Timothy G. Pollard, PLS 1474, on February 02, 2023. Bearings are Based on an deed bearing of S89°06'20"W, on the North Line of said NE1/4 and as shown on attached Easement Sketch, said easement further described as: being Ten (10) feet in width, Five (5.00) feet each side of a centerline described as follows:

COMMENCING at the NE corner of said NE1/4 of said Section 23;

Thence S89°06'20"W, on the North Line of the NE1/4 of said Section 23, for a distance of 48.57 feet;

Thence S00°53'40"E, for a distance of 1311.80 feet, to the **POINT OF BEGINNING**;

Thence N80°26'37"E, on said centerline for a distance of 73.90 feet;

Thence S71°12'46"E, on said centerline for a distance of 157.52 feet;

Thence S77°53'55"E, on said centerline for a distance of 113.25 feet;

Thence N71°38'22"E, on said centerline for a distance of 23.04 feet;

Thence N00°22'50"W, on said centerline for a distance of 710.02 feet, to a certain **POINT "A"**;

Thence N00°22'50"W, on said centerline for a distance of 232.82 feet, to the **POINT OF TERMINATION**.

AND

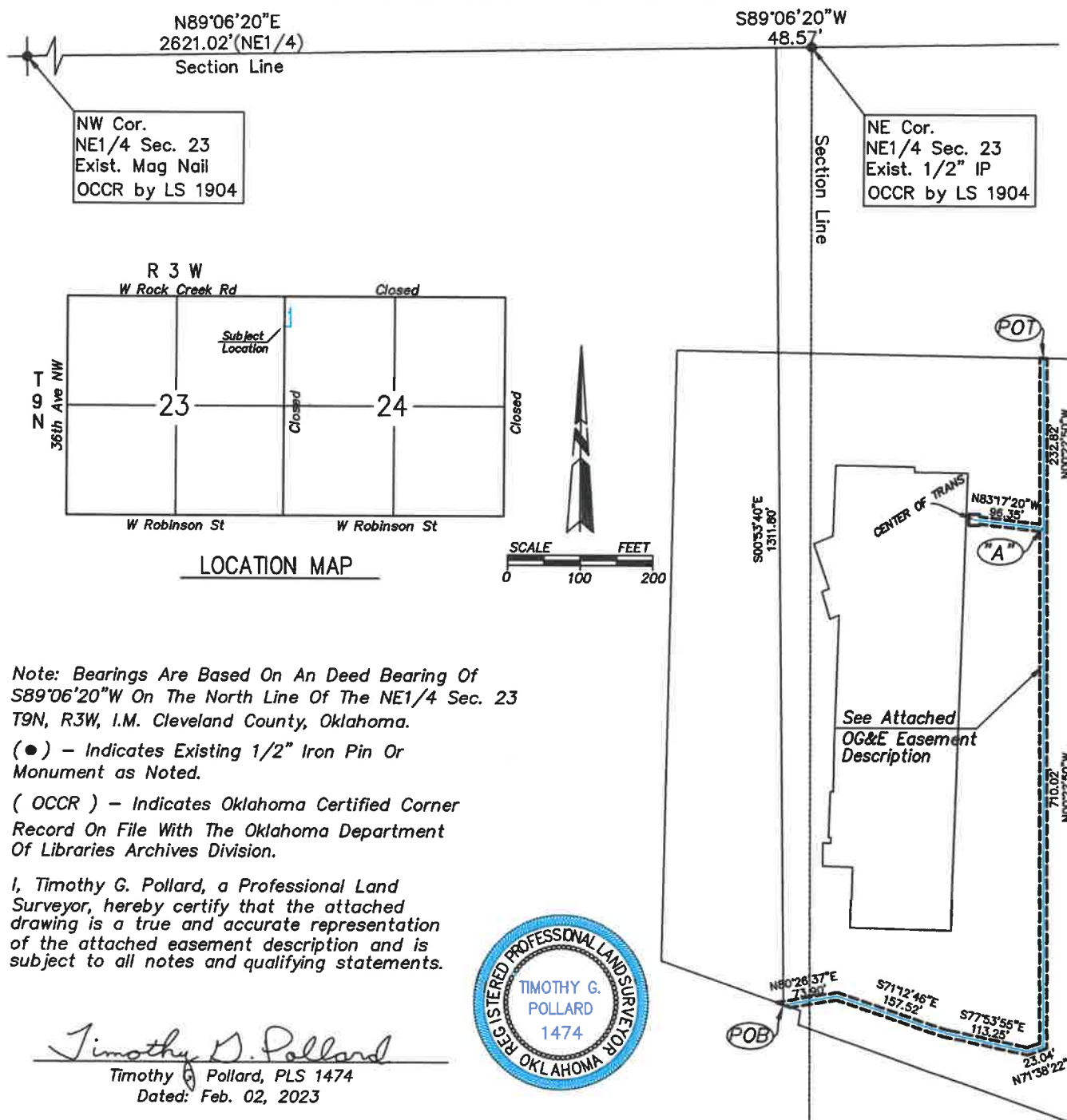
An easement in the **NORTHWEST QUARTER (NW1/4) OF SECTION TWENTY-FOUR (24), TOWNSHIP NINE (9) NORTH, RANGE THREE (3) WEST** of the Indian Meridian, Cleveland County, Oklahoma, written by Timothy G. Pollard, PLS 1474, on February 02, 2023. Bearings are Based on an deed bearing of S89°06'20"W, on the North Line of said NE1/4 and as shown on attached Easement Sketch, said easement further described as: being Ten (10) feet in width, Five (5.00) feet each side of a centerline described as follows:

BEGINNING at a certain **POINT "A"** as described above;

Thence N83°17'20"W, on said centerline for a distance of 96.35 feet to the center of a Fifteen (15) feet by Fifteen (15) feet transformer easement being made part of this easement also being the **POINT OF TERMINATION**.

EXHIBIT "B"

EASEMENT SKETCH



OKLAHOMA GAS AND ELECTRIC COMPANY

POLLARD & WHITED SURVEYING INC. 2514 TEE DRIVE, NORMAN, OKLAHOMA 73069 CA#2380 EXP 06-30-23 405-366-0001	OG&E EASEMENT SKETCH WO# 7708969 PART OF THE NE1/4 SEC 23 AND NW1/4 SEC 24, T9N, R3W, I.M. CLEVELAND COUNTY, OKLAHOMA	REVISIONS:	
DRAWN BY: J. THOMAS	DATE: Feb. 02, 2023	FILE #: 23-9N3W.ASC	DATE: Feb. 02, 2023
APPROVED BY: D. MEES	DATE: Feb. 02, 2023	DRWG #: 23-9N3W.DGN	DATE: Oct. 02, 2023
		SCALE: 1" = 200'	
		SHEET 1 OF 1	

CIRCUIT ID: 872731
STATION NUMBER: 303566
ADDRESS: 2501 Conference Center Blvd. - Norman
SUBSTATION: STUBBEMAN
TOWNSHIP/RANGE: 09N-03W1
SECTION: 23
QTR SECTION: NE
ATLAS: 59-273B
LAT/LONG: 35.24407/-97.47786

Project Manager: Rusty Baldwin 405-553-5183
Designer: Wes Timm 309-267-6442
Site Contact: Kyle Arnold 405-343-8465
Electrician: Paul Baker 405-799-9994

Foreman's Notes:
EQ ok when dry.
Easement required.

PM Notes:
Construction has started.
Site not staked as of 8/30/2022.

WL #8:
PL: 750kVA (480/277, 12.5/7.2kV,
STA# 462500, 98% loaded)
(U562.3)

Note: Face transformer South

WL #9:
PL: 3-500:5 JAK-0W CTs
in CTCab 462500-40
to serve 1200A entrance
(U765.2)

Note: Customer to place load pipes
and pull in load wires to YFAC

WL #10:
PL: 75' Trench, Pull in 85' of
4/C 500AL (208/120V) in
4P40 to
3-500:5 JAK-0W CTs
in CTCab 456963-30
to serve 600A entrance
(U765.2)

YOUNG FAMILY ATHLETICS CENTER

Norman

WL #11:
PL: 320' Bore and
stub up 4P40F for
future primary extension

WL #7:
PL: 440' Bore, Pull in
3-2/C 2AL(515) (12.5/7.2kV)
in 4P40F

WL #6:
PL: Pull box
(U125)

WL #5:
PL: 360' Bore, Pull in
3-2/C 2AL(515) (12.5/7.2kV)
in 4P40F

WL #1:
RM: 25kVA (120/240, 7.2kV
STA# 420653)
2/C 2AL (7.2kV)
(21)

WL #3:
PL: 415' Bore, Pull in
3-2/C 2AL(515) (12.5/7.2kV)
in 4P40F

WL #2:
RM: 7A Fuse and replace w/
3-65A Fuses (STA# 163416)
(U614)

WL #4:
PL: 150 kVA (480/277, 12.5/7.2kV,
STA# 465787)
(U562.3)

Note: transformer will be used
in future build; face transformer West

STAKED 1/10/23
SURVEYED 1/10/23
WAITING ON DATA
EASEMENT PREPARED 1/18/23

YFAC
7708969
Sheet 1 of 6

Easement Item 14. 24

File Attachments for Item:

15. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF FINAL PLAT FP-2223-9: A FINAL PLAT AND SITE PLAN FOR TAKE FIVE NORMAN ADDITION. (LOCATED AT THE SOUTHWEST CORNER OF THE INTERSECTION OF CLASSEN BOULEVARD AND CEDAR LANE ROAD).



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Ken Danner, Subdivision Development Manager

PRESENTER: Shawn O'Leary, Director of Public Works

TITLE: CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF FINAL PLAT FP-2223-9: A FINAL PLAT AND SITE PLAN FOR TAKE FIVE NORMAN ADDITION. (LOCATED AT THE SOUTHWEST CORNER OF THE INTERSECTION OF CLASSEN BOULEVARD AND CEDAR LANE ROAD).

BACKGROUND:

This item is a final site development plan and final plat for Take Five Norman Addition located at the southwest corner of the intersection of Classen Boulevard and Cedar Lane Road. The property consists of 1.38 acres and one commercial lot. The lot is a proposed as an automotive oil change facility.

City Council, at its meeting of April 26, 2022, adopted Ordinance O-2122-39 placing this property in the C-2, General Commercial District. In addition, City Council, at its meeting of April 26, 2022 approved the preliminary plat for Take Five Norman Addition.

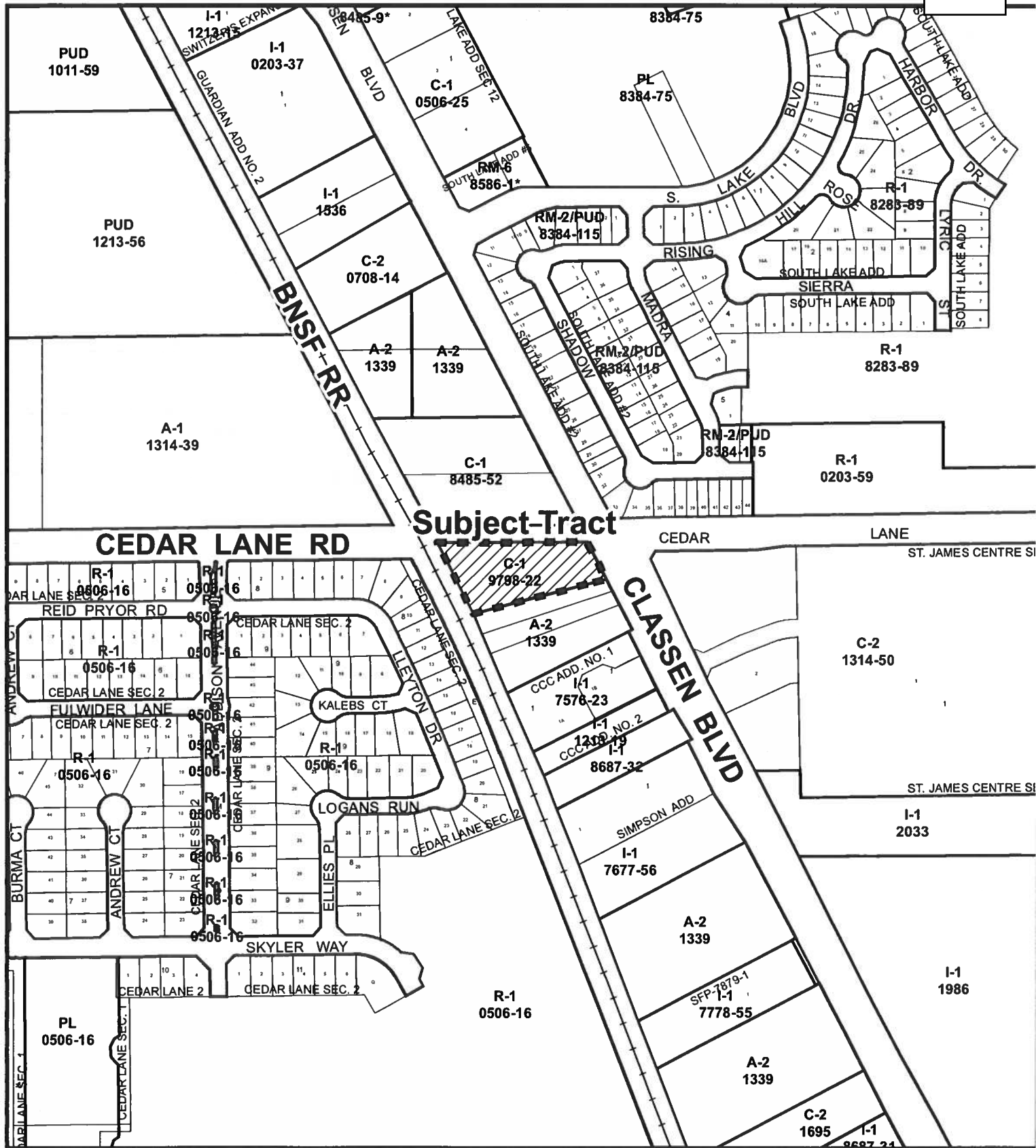
The Norman Development Committee, on December 27, 2022, accepted Subdivision Bond B-2223-55 securing public improvements. On December 30, 2022, the Norman Development Committee approved the program of public improvements, site plan and final plat for Take Five Norman Addition.

DISCUSSION:

Construction plans have been reviewed for the required public improvements for this development. These improvements consist of a public sanitary sewer main under Classen Boulevard, drainage and sidewalk. Stormwater runoff will be conveyed to a privately maintained detention facility.

RECOMMENDATION:

The final plat is consistent with the approved preliminary plat. Based on the above information, staff recommends acceptance of the public dedications, approval of the site plan and final plat and filing of the final plat for Take Five Norman Addition. In addition, staff has received \$129,540 in recoupment fees in connection with the Cedar Lane Road Paving Project.



Location Map



Map Produced by the City of Norman
Geographic Information System.
The City of Norman assumes no
responsibility for errors or omissions
in the information presented.

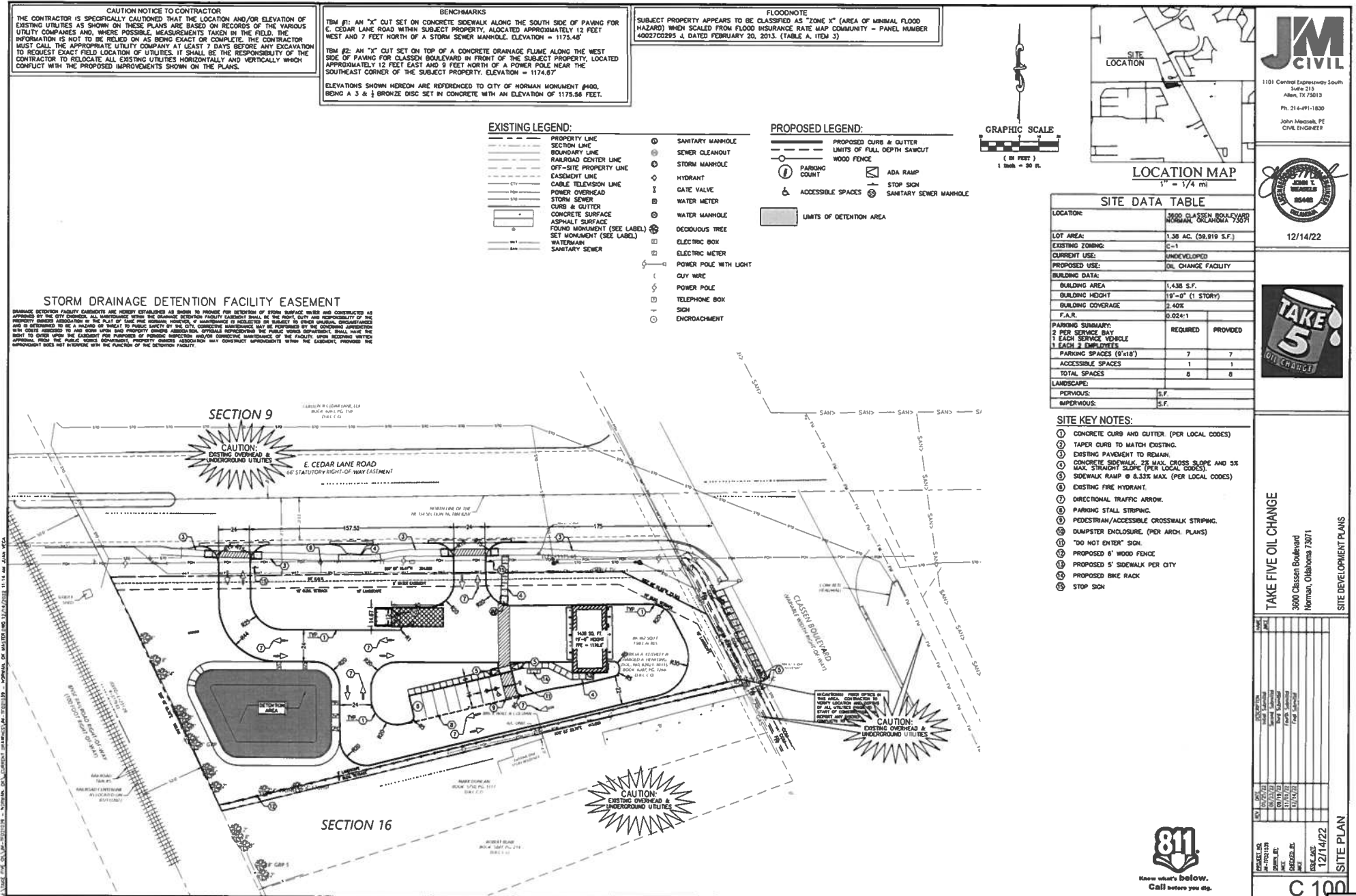


February 9, 2022

0 200 400 Ft.

Subject Tract

Zoning

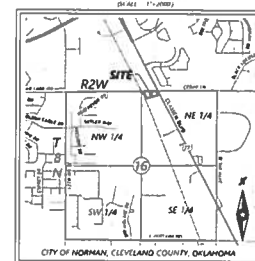


PRELIMINARY PLAT

TAKE FIVE NORMAN

LOT 1, BLOCK 1
1.983 ACRES OUT OF THE NORTHEAST QUARTER (NE/4)
OF SECTION 16, TOWNSHIP 8 NORTH,
RANGE 2 WEST OF THE INDIAN MERIDIAN
CITY OF NORMAN, CLEVELAND COUNTY, OKLAHOMA
PAGE 1 OF 1

VICINITY MAP



PROFESSIONAL LAND SURVEYOR'S CERTIFICATE

1, SCOTT R. BERGHEIMER DO CERTIFY THAT I AM A LICENSED PROFESSIONAL LAND SURVEYOR IN THE STATE OF OKLAHOMA, AND THAT THE ANNEXED PLAN OF LOT 1, BLOCK 1, TAKE FIVE (5) ADDITION, AN ADDITION TO THE CITY OF NORMAN, CLEVELAND COUNTY, STATE OF OKLAHOMA, CONSISTING OF ONE (1) SHEET, REPRESENTS A SURVEY MADE BY ME UNDER DIRECT SUPERVISION ON THE 11TH DAY OF JANUARY, 2022 AND THAT THE MONUMENTS NOTED HEREON ARE ACTUALLY EXIST AND CORRECTLY POSITIONED. AND THIS ORIGINAL SURVEY MEETS THE OKLAHOMA SURVEYING STANDARDS FOR THE PRACTICE OF LAND SURVEYING AS ADOPTED BY THE OKLAHOMA STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS, AND THAT SAID PLAN COMPLIES WITH THE REQUIREMENTS OF TITLE 11, SECTION 41-108 OF THE OKLAHOMA STATE STATUTES.

JH CIVIL ENGINEERING
 1011 CENTRAL EXPRESSWAY SOUTH #211
 ALLEN, TX 75013

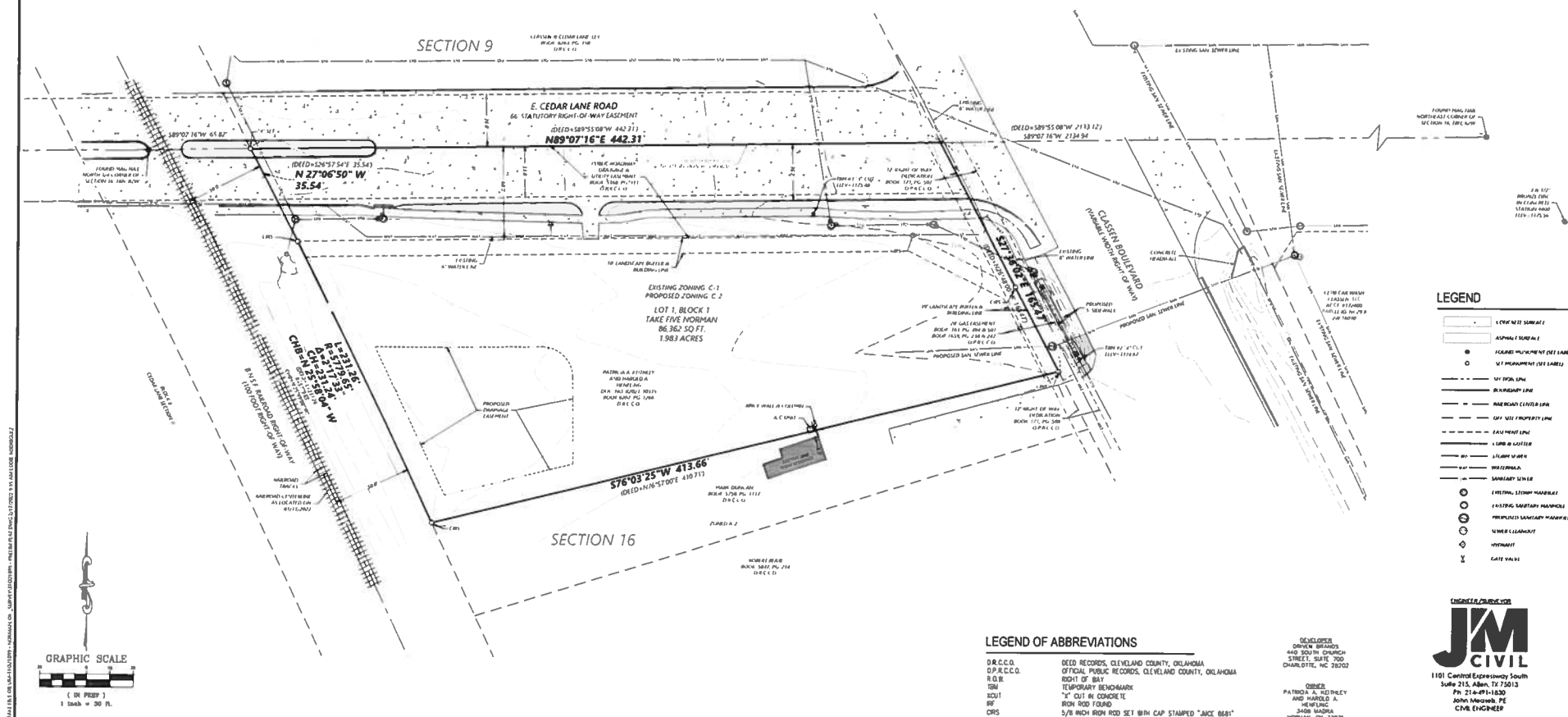
SCOTT BERCHER, P.E.
 OK LICENSE NO. 1986
 CERTIFICATE OF AUTHORIZATION NO. RA

PRELIMINARY

THIS DOCUMENT SHALL NOT BE RECORDED
FOR ANY PURPOSE AND SHALL NOT BE
USED OR VIEWED OR RELIED UPON AS A
FINAL SURVEY DOCUMENT.

GENERAL NOTES

1. SUBJECT PROPERTY APPEARS TO BE CLASSIFIED AS "ZONE X" (AREA OF MINIMAL FLOOD HAZARD) WHEN SCALED FROM FLOOD INSURANCE RATE MAP COMMUNITY - PANEL NUMBER 400730295, DATED FEBRUARY 20, 2013. (TABLE A, ITEM 3)
2. BEARINGS AND DISTANCES SHOWN HEREON ARE REFERENCED TO THE OKLAHOMA STATE PLANE COORDINATE SYSTEM OF 1983, SOUTH ZONE, AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983, 2011 ADJUSTMENT WITH A COMBINED SCALE FACTOR OF 1.00012.
3. ELEVATIONS SHOWN HEREON ARE REFERENCED TO CITY OF NORMAN MONUMENT #400, BEING A 3 & 1/2 INCH BRONZE DISC SET IN CONCRETE WITH AN ELEVATION OF 1175.58 FEET.
4. EASEMENTS DEDICATED PURSUANT TO THIS PLAT ARE ONLY THOSE THAT BE WITHIN THE PLAT BOUNDARY.



DEVELOPMENT COMMITTEE

FINAL PLAT
FP-2223-9

DATE:
December 30, 2022

STAFF REPORT

ITEM: Consideration of a Final Plat for **TAKE FIVE NORMAN ADDITION**

LOCATION: Located at the southwest corner of the intersection of Classen Boulevard (U.S. Highway No. 77) and Cedar Lane Road.

INFORMATION:

1. Owners. The Henfling Living Trust: Patricia Keithley.
2. Developer. Driven Brands, Inc.
3. Engineer. JM Civil Engineering.

HISTORY:

1. October 21, 1961. City Council adopted Ordinance No. 1318 annexing this property into the Norman Corporate City Limits without zoning.
2. December 12, 1961. City Council adopted Ordinance No. 1322 placing this property in the A-2, Rural Agricultural District.
3. June 20, 1967. Planning Commission, on a vote of 7-0, recommended to City Council that this property be placed in the I-1, Light Industrial District and removed from A-2, Rural Agricultural District.
4. September 12, 1967. City Council adopted Ordinance No. 1986 placing this property in the I-1, Light Industrial District and removing it from A-2, Rural Agricultural District.
5. November 13, 1997. Planning Commission, on a vote of 8-0, postponed the request to place this property in the C-1, Local Commercial District with special use for gasoline sales and removing it from I-1, Light Industrial District at the request of staff.
6. November 13, 1997. Planning Commission, on a vote of 8-0, postponed the preliminary plat for Diane Addition at the request of staff.

Development Committee – Final Plat for Take Five Norman Addition.
 December 30, 2022
 Page 2

7. December 11, 1997. Planning Commission, on a vote of 7-0, recommended to City Council that this property be placed in the C-1, Local Commercial District without a special use for gasoline sales and removed from I-1, Light Industrial District.
8. December 11, 1997. Planning Commission, on a vote of 7-0, approved the preliminary plat for Diane Addition.
9. February 24, 1998. City Council adopted Ordinance No. O-9798-22 placing this property in C-1, Local Commercial District and removing it from I-1, Light Industrial District. With the applicant's concurrence, rezoning with special use for gas sales was deleted.
10. March 10, 2022. Planning Commission, on a vote of 5-0, recommended to City Council that this property be place in the C-2, General Commercial District and removed from C-1, Local Commercial District
11. March 10, 2022. Planning Commission, on a vote of 5-0, recommended to City Council the approval of the preliminary plat for Take 5 Addition.
12. April 26, 2022. City Council adopted Ordinance No. O-2122-39 placing this property in the C-2, General Commercial District and removing it from C-1, Local Commercial District.
13. April 26, 2022. City Council approved the preliminary plat for Take 5 Addition.

IMPROVEMENT PROGRAM:

1. Fire Hydrant. There is an existing fire hydrant to serve the property.
2. Permanent Markers. Permanent markers will be installed prior to filing of the final plat.
3. Sanitary Sewers. A public sanitary sewer main will be installed from the east side of Classen Boulevard to serve the property. Improvements will be installed in accordance with approved plans and City and Oklahoma Department of Environmental Health standards. The agent for the applicant will need to obtain a permit from Department of Transportation for boring under Classen Boulevard. A portion of the sanitary sewer system will be private with a private lift station.
4. Sidewalks. There are existing sidewalks adjacent to Cedar Land Road. The developer will construct sidewalks adjacent to Classen Boulevard.
5. Storm Sewers. Storm sewers and appurtenant drainage structures will be installed in accordance with approved plans and City drainage standards. Privately maintained detention facilities will be constructed for the conveyance of storm water.
6. Streets. Classen Boulevard and Cedar Lane Road street paving are existing.

Development Committee – Final Plat for Take Five Norman Addition.
December 30, 2022
Page 3

7. Water Mains. Water Mains. There is an existing 12-inch water main adjacent to Cedar Lane Road and 8-inch and 12-inch adjacent to Classen Boulevard.

PUBLIC DEDICATIONS:

1. Easements. All required easements will be dedicated to the City on the final plat.
2. Rights-of-Way. Street rights-of-way will be dedicated to the City on the final plat.

SUPPLEMENTAL MATERIAL: Copies of a location map, preliminary plat, site plan and final plat are attached.

STAFF COMMENTS AND RECOMMENDATION: The engineer for the developer has requested the City Development Committee approve the program of public improvements, site plan and final plat and submit the site plan and final plat to City Council for consideration.

This property consists of 1.38 acres with one (1) proposed commercial lot for an oil change facility.

The Development Committee approved concurrent construction with the acceptance of Subdivision Bond No. B-2223-55.

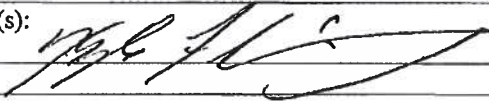
The final plat is consistent with the approved preliminary plat.

APPLICATION FOR
DEVELOPMENT COMMITTEE
ACTION

Date: December 5, 2022

Part I: To be Completed by Applicant:

1. Applicant(s):
Kyle Flaming
JM Civil Engineering, LLC

Signature of Applicant(s): 

Telephone Number and Address:
1101 Central Expy S., Suite 215
Allen, Texas 75013
(469) 270-3758
2. Project Name and Legal Description:
Lot 1 Block 1, Take Five Norman
3. Action Request of Development Committee:
Approve Plat for forwarding to City Council to approve and record.

Part II: To Be Completed by Development Committee:



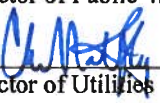
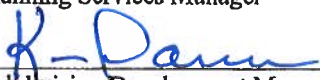
Development Committee Met on: December 30, 2022

Development Committee Findings:

The engineer for the owner/developer has requested the Development Committee approve the program of public improvements, site plan and final plat for Take Five Norman Addition and submit to City Council for consideration.

Development Committee Recommendations:

Recommend the City Council approve the final plat for Take Five Norman Addition.

		Record of Acceptance:			
	Yes	No		Yes	No
 Director of Public Works	<input checked="" type="checkbox"/>	<input type="checkbox"/>	 Director of Planning	<input checked="" type="checkbox"/>	<input type="checkbox"/>
 Director of Utilities	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Planning Services Manager	<input type="checkbox"/>	<input type="checkbox"/>
City Engineer	<input type="checkbox"/>	<input type="checkbox"/>	 Subdivision Development Manager	<input checked="" type="checkbox"/>	<input type="checkbox"/>

File Attachments for Item:

16. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF FINAL ACCEPTANCE OF CONTRACT K-2021-35: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND FLINTCO, INC., FOR THE NORTH BASE COMPLEX PROJECT, PHASE 1, AND FINAL PAYMENT IN THE AMOUNT OF \$227,443.96.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 1/24/23

REQUESTER: Paul D'Andrea, Capital Projects Engineer

PRESENTER: Shawn O'Leary, Public Works Director

ITEM TITLE: CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF FINAL ACCEPTANCE OF CONTRACT K-2021-35: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, AND FLINTCO, INC., FOR THE NORTH BASE COMPLEX PROJECT, PHASE 1, AND FINAL PAYMENT IN THE AMOUNT OF \$227,443.96.

BACKGROUND:

Parks Maintenance Facility: On October 13, 2015, the citizens of Norman voted to fund the Norman Forward Program with a limited term ½ percent sales tax increase for 15 years. This initiative included a number of high-priority projects outlined in the 2014 Library Master Plan Update, the 2009 Norman Parks and Recreation Master Plan and additional projects designed to provide recreational opportunities for Norman residents. One such project was the construction of the Griffin Park Sports Complex.

The Norman Forward Program includes a Maintenance Facility for the City of Norman Parks and Recreation Department. This facility was originally to be relocated from Reaves Park to Griffin Park; however, the City constructed combined Park Maintenance and City Transit/Public Safety Maintenance Facilities adjacent to the City's current Fleet Maintenance Facility at the North Base Complex located at 1310 Da Vinci Street near the Norman Municipal Airport. The multi-departmental facility provides maintenance for Parks and Recreation vehicles and equipment, City transit system buses, and public safety vehicles and equipment.

Transit Maintenance Facility: In August of 2018, University of Oklahoma officials advised City staff of their desire to transfer non-campus bus services in Norman to another operator by the end of the 2019 fiscal year. On July 1, 2019, operation of non-campus bus services in Norman was transferred from the University to the City. Maintenance for the large-chassis transit system fleet is performed at the combined Public Transit/Public Safety Fleet Maintenance Facility at 1310 Da Vinci Street

North Base Complex Design: On March 14, 2017, the Norman City Council approved Contract K-1617-114 with PDG, LLC d.b.a. Planning Design Group, in the amount of \$761,000 for Professional Architectural Design Services for the Griffin Park Sports Complex.

Because PDG, LLC was performing the professional architectural design services for the Griffin Park Sports Complex, City staff recommended amending their contract to include design of the new Parks Maintenance Facility. These services were over and above those included in Contract K-1617-114. Due to the desire to co-locate the Parks, Transit, and Public Safety Maintenance Facilities at the North Base Campus, staff further recommended including master planning and design of the Transit and Public Safety Maintenance Facilities in the amended contract.

On August 27, 2019, City Council approved Amendment No. 1 to Contract K-1617-114 with PDG, LLC d.b.a. Planning Design Group, in the amount of \$430,280 for additional Professional Architectural Design Services to add the Park Maintenance Facility and Transit/Public Safety Maintenance Facility to the existing contract for the Griffin Park Sports Complex.

On April 14, 2020, City Council approved Amendment No. 3 to Contract K-1617-114 with PDG, LLC d.b.a. Planning Design Group, in the amount of \$316,370 for additional professional design services to provide an increased project scope and to add bidding services and construction administration services for the Park Maintenance Facility and Transit/Public Safety Maintenance Facility to the existing contract for the Griffin Park Sports Complex.

On September 8, 2020, City Council approved Amendment No. 5 to Contract K-1617-114 with PDG, LLC d.b.a. Planning Design Group, in the amount of \$49,500 for additional architectural design services for the proposed Parks and Transit/Public Safety Maintenance Facility to include proposed building and parking revisions, project phasing, renderings, and inclusion of federal third party contracting requirements needed for FTA Grant funding.

On September 8, 2020, City Council also approved Amendment No. 4 to Contract K-1516-110 between the City of Norman, The Norman Municipal Authority, and ADG, P.C., in the amount of \$157,180 adding Construction Phase Services for the North Base Complex, Project, Phase 1, to the scope of projects receiving program management services.

On October 13, 2020, City Council approved Contract K-2021-35 with Flintco LLC, in the amount of \$8,648,000 for the Park Maintenance Facility and the Transit/Public Safety Maintenance Facility.

On March 9, 2021, City Council approved Change Order No. 1 to Contract K-2021-35 with Flintco LLC, in the amount of \$64,737.65 and adding 20 calendar days to the Parks Maintenance Facility and the Transit/Public Safety Maintenance Facility.

On July 13, 2021, City Council approved Change Order No. 2 to Contract K-2021-35 with Flintco LLC, in the amount of \$76,156.98 and adding 39 Calendar Days for the Parks Maintenance Facility and the Transit/Public Safety Maintenance Facility.

On October 12, 2021, City Council approved Change Order No. 3 to Contract K-2021-35 with Flintco LLC, in the amount of \$102,609.21 and adding 58 calendar days for Parks Maintenance Facility and the Transit/Public Safety Maintenance Facility.

On January 25, 2022, City Council approved Change Order No. 4 to Contract K-2021-35 with Flintco LLC, in the amount of \$93,249.12 and adding 41 Calendar Days for the Park Maintenance Facility and the Transit/Public Safety Maintenance Facility.

On April 26, 2022, City Council approved Change Order No. 5 with Flintco, LLC, for the North Base Complex Project, Phase 1, in the amount of \$81,184.41 plus 14 additional calendar days, for the Base Bid and Bid Alternate No. 1.

On June 28, 2022, City Council approved a partial reduction in retainage from 5% to 2.5% for Contract K-2021-35.

DISCUSSION:

As of January 13, 2023, Flintco, LLC had completed all work associated with the North Base Complex Project, Phase 1, contract. All final punch list items have been addressed and a list of outstanding warranty items has been provided to Flintco.

All changes to the contract have been addressed by previous change orders, so no final change order is necessary. All that remains to be paid is the remaining 2.5% retainage withheld while Flintco addressed the punch list items. The final cost for the North Base Complex, Phase 1 construction is \$9,097,758.42 or 5.20% over the original construction contract.

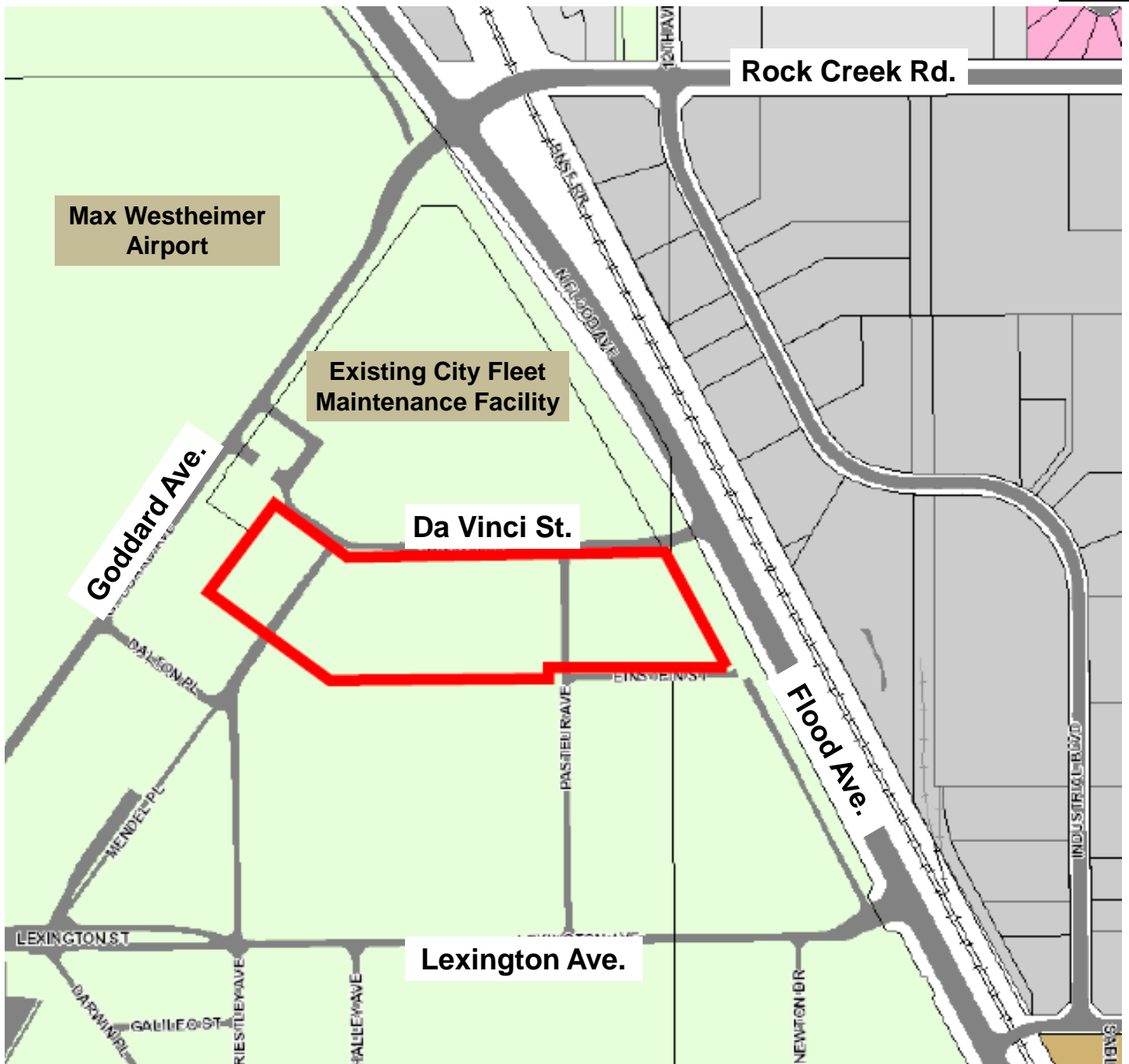
The City will issue final payment, including retainage, of \$227,443.96, upon final acceptance of the project by City Council. At that time, maintenance bonds associated with the contract will go into effect.

The funds for the final retainage invoices will be paid from the following projects and accounts:

- Norman Forward Fund, Reaves Park, Construction (Account 51792205-46101; Project NFB006)
- Capital Fund, North Base Projects, Construction (Account 50590078-46101; Project BG0081)
- Capital Fund, General Buildings, Construction (Account 50193365-46101; Project BG0252)

RECOMMENDATION:

Staff recommends the final acceptance of Contract K-2021-35 with Flintco, LLC and authorization of payment of retainage in the amount of \$227,443.96.



North Base Complex, Phase 1 Location Map





File Attachments for Item:

17. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AND/OR POSTPONEMENT OF AMENDMENT NO. THREE TO CONTRACT K-2122-81 BY AND BETWEEN THE NORMAN MUNICIPAL AUTHORITY AND CROSSLAND CONSTRUCTION COMPANY, INC., ESTABLISHING THE GUARANTEED MAXIMUM PRICE IN THE AMOUNT OF \$568,189 FOR PHASE 6-B OF THE GRIFFIN PARK REMODEL PROJECT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 2/14/2023

REQUESTER: Wade Thompson, Parks and Facilities Manager

PRESENTER: Jason Olsen, Parks and Recreation Director

ITEM TITLE: CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AND/OR POSTPONEMENT OF AMENDMENT NO. THREE TO CONTRACT K-2122-81 BY AND BETWEEN THE NORMAN MUNICIPAL AUTHORITY AND CROSSLAND CONSTRUCTION COMPANY, INC., ESTABLISHING THE GUARANTEED MAXIMUM PRICE IN THE AMOUNT OF \$568,189 FOR PHASE 6-B OF THE GRIFFIN PARK REMODEL PROJECT.

BACKGROUND:

On October 13, 2015, Norman citizens passed the Norman Forward Initiative, which will fund various projects through a ½ % sales tax increase over 15 years. Included in the Norman Forward Initiative is an upgrade of the Griffin Park Soccer Complex. Eventually, all of the Griffin Park sports fields will be converted to soccer and will include the creation of 22 youth fields.

DISCUSSION:

On December 14, 2021, City Council approved Contract K-2122-81 with Crossland Construction to provide construction management at-risk (CMaR) service for the Griffin Park Remodel Project. The initial contract amount of \$14,450 was approved to provide pre-construction services which, to date, have included plan review, scheduling, and bidding services.

On February 8, 2022, NMA/City Council approved Amendment / Guaranteed Maximum Price (GMP) #1, which included earthwork; demolition; site concrete; painting; fencing and landscaping; estimating and construction contingencies; general conditions for the entire project; and indirect costs, which included bonding, insurance, and CMaR fees (profit). The total for GMP #1 was \$1,370,970 (making the then-cumulative total for Contract K-2122-81 of \$1,385,420).

On July 26, 2022, NMA/City Council Approved Amendment / Guaranteed Maximum Price (GMP) #2, which included demolition; concrete and masonry work; structural steel; door assemblies supply; flooring and wall tile; painting; signage; plumbing; HVAC; electrical; earthwork; additional site concrete work; asphalt; additional fencing; irrigation; turf sprigging, sod & mulch; site furnishings and utilities; and storm sewer systems. The total for the work bid on GMP 2 was \$6,576,243 (making the then-cumulative total for Contract K-2122-81 of \$7,961,663).

Construction bids for the current amendment were opened on December 22, 2022. This project is for a road connecting the southeast parking lot to the intersection at 12 Avenue NE and High Meadows Drive. This was identified as part of the traffic study specifically for the Griffin Park Remodel in 2017, and it outlined this section of road to be added to handle the anticipated increase in the flow of traffic entering and exiting Griffin Park. The bid package included additional earthwork; site concrete; asphalt; sod; and storm sewer systems. The total for the work bid is \$518,374.

The total for GMP/Amendment #3 is \$568,189, which includes the indirect costs and fees of \$49,815 making the current cumulative total \$8,529,852 for Contract K-2122-81 with Crossland Construction Company.

The City/Norman Municipal Authority's Project Consultants from ADG have participated throughout the entire process of the project. Further, the amendment documents have been reviewed and approved by the City Attorney's office.

Adequate funds are available for this contract in the Griffin Park Remodel project, Construction (account 51796639-46101; project NFB001).

RECOMMENDATION:

It is recommended that the City Council, acting as the Norman Municipal Authority, approve Amendment No. 3 to Contract K-2122-81 with Crossland Construction Company, Inc., establishing a Guaranteed Maximum Price in the amount of \$568,189 for Phase 6-B of the Griffin Park Remodel Project.

**AMENDMENT NO 3 TO CONSTRUCTION MANAGER AT RISK AGREEMENT
BETWEEN THE CITY OF NORMAN AND CROSSLAND CONSTRUCTION
COMPANY**

THIS AMENDMENT NO. 3 TO CONSTRUCTION MANAGER AT RISK AGREEMENT (this “Third Amendment”) is made as of January 10th, 2023, between the City of Norman, and Crossland Construction Company, Inc. an Kansas corporation (the “Construction Manager”).

RECITALS:

A. The City of Norman and the Construction Manager entered into that certain Construction Manager at Risk Agreement (Contract No. K-2122-81), dated March 24, 2020, (the “Agreement”), for construction management services for the Griffin Community Park project including plan review, design assistance, bidding services, and value engineering.

B. Pursuant to Section 2.2 of the Agreement, (i) once the drawings and specifications are complete, and after the award of subcontracts to subcontractors, the Construction Manager shall propose a guaranteed maximum price (“GMP”), which shall be the sum of all subcontracts, lump sum self-perform amounts, including allowances and contingencies, and the Construction Manager’s fee.

C. The Construction Manager submitted the second of three anticipated GMP Proposals to the City Council. The original contract value for preconstruction services was \$14,450. GMP No. 1 was approved on February 8th, 2022 for a total contract amount of \$1,370,970 (derived from the total cost of work for the Construction Phase of \$1,074,392 + the indirect Cost and Fee of \$296,578). GMP No. 2 was approved on July 26th, 2022 for a total contract amount of \$6,576,243 (derived from the total cost of work for the Construction Phase of \$5,566,310 + the Indirect Cost and Fee of \$1,009,933). The total amount of all amendments combined represent the total contract amount of \$8,529,852. Preconstruction Services were billed separately and are not included in GMP per previous Council approval attributed to the Griffin Park Project.

D. The Construction Manager now submits the third of three anticipated GMP Proposals based on bids received.

AGREEMENT:

NOW, THEREFORE, in consideration of the foregoing recitals, which are incorporated herein by reference, other such good and valuable consideration, the receipts, and sufficiency of which are hereby acknowledged, and the promises and covenants set forth below, The City of Norman and the Construction Manager hereby agree as follows:

1. Third GMP Established. The Construction Manager’s guaranteed maximum price for the Work inclusive of all subcontracts, lump sum self-perform amounts, including allowances and contingencies and the Construction Manager’s fee, is hereby agreed to be \$568,189 (derived from the total cost of work for the Construction Phase of \$518,374 + the Indirect Cost and Fee of \$49,815. Preconstruction Services were billed separately not included in GMP per previous

Council approval attributable to the Griffin Park Project). The GMP is the total compensation from the City to the Construction Manager for its fee for the performance of the work in accordance with Contract Documents and Pursuant to any of the following documents, as applicable:

- A. Basis for GMP. Refer **Exhibit _A_** to GMP #3 Letter
- B. Contract Document Log. Refer to **Exhibit _B_** for a list of the Drawings and Specifications, including all addenda that were used in preparation of the GMP Proposal, is attached hereto as Exhibit _B_ and incorporated herein by reference.
- C. Allowances. Refer to **Exhibit _C_** for a list of allowances included by the Construction Manager in preparation of this GMP Proposal, is attached hereto as Exhibit _C_ and incorporated herein by reference.
- D. Assumptions. Refer to **Exhibit _D_** for a list of the assumptions and clarifications made by the Construction Manager in the preparation of the GMP Proposal to supplement the information contained in the Drawings and Specifications is attached hereto as Exhibit _D_ and incorporated herein by reference.
- E. Proposed GMP. Refer to **Exhibit _E_** for the proposed GMP, including a statement of the estimated cost organized by trade categories, allowances, contingency, General Conditions, and other items and the Fee that comprise the GMP is attached hereto as Exhibit _E_ and incorporated herein by reference.
- F. Substantial Completion. Refer to **Exhibit _F_** for Substantial Completion date upon which the GMP Proposal is based and a schedule of the Construction Documents issuance dates upon which the date of Substantial Completion is based is attached hereto as Exhibit _F_ and incorporated herein by reference.
- G. Acceptance Period. The time limit for acceptance of the GMP Proposal is attached hereto as part of **Exhibit _G_**.

2. Effect of Amendment. In all other respects, the Agreement is affirmed and ratified and, except as expressly modified herein, all terms and conditions of the Agreement shall remain in full force and effect.

3. Non-Default. By executing this Third Amendment, the Construction Manager affirmatively asserts that (i) The City of Norman is not currently in default, nor has been in default at any time prior to this Fourth Amendment, under any of the terms or conditions of this Agreement and (ii) any and all claims, known and unknown, relating to the Agreement and existing on or before the date of this Fourth Amendment are forever waived.

[REMAINDER OF THIS PAGE LEFT INTENTIONALLY BLANK]

[SIGNATURE ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the Parties have executed this THIRD AMENDMENT in multiple copies on the respective dates herein below reflected to be effective on the date executed by the City of Norman.

CONSTRUCTION MANAGER (CROSSLAND CONSTRUCTION COMPANY, INC)

By: 

Name: Aaron R. Stoops

Title: Vice President

Date: 1.3.23

ATTEST:

By: 

Subscribed and Sworn to me this 3 day of January, 2023.

Commission Number: 21009617

Expiration Date: 07/22/25



THE CITY OF NORMAN

Reviewed and approved for form and legality this _____ day of _____, 2023.

Office of the General Counsel

Approved by The City of Norman on this _____ day of _____, 2023.

By: _____

Larry Heikkila, Mayor

ATTEST:

By: _____

Brenda Hall, City Clerk

K-2122-81 Griffin Park - Exhibit ADecember 30th, 2022

Wade Thompson
Parks Superintendent
City of Norman

RE: City of Norman – Griffin Park Phase 6-B
Recommendation Award Letter Bid Package #03 - Letter #3

CROSSLAND
CONSTRUCTION COMPANY, INC.

408 NE 145th Place
Oklahoma City, OK 73013
tel 405.748.5043
fax 405.748.7214

Dear Mr. Wade Thompson,

For the above referenced project, we are proposing a guaranteed maximum price (GMP) of five hundred sixty eight thousand one hundred and eighty-nine dollars (**\$568,189**).

Bids for the City of Norman Griffin Park Phase 6-B – Bid Package #3, were received and publicly read aloud in at 201 W. Gray, Norman, OK 73069 on December 22nd, 2022 at 2:00 PM CST. The bidding process was conducted in accordance with the Oklahoma Public Competitive Bidding Act, 61 O.S. 1974, §101

Crossland Construction Company has reviewed the bids for qualifications, completeness, responsiveness, cost, & best value to the owner. For additional information, see breakout pages & summaries below.

<u>Subcontractor / Supplier</u>	<u>Total</u>
31A Earthwork (Ellsworth)	\$85,276
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Ellsworth, for this trade contract. Scope includes the entirety of trade contract 31A as detailed in Bid Package #03 documents. 	
32A Site Concrete (Turning Point)	\$64,600
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Turning Point, for this trade contract. Scope includes the entirety of trade contract 32A as detailed in Bid Package #03 documents. 	
32B Asphalt (Turning Point)	\$150,200
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Turning Point, for this trade contract. Scope includes the entirety of trade contract 32B as detailed in Bid Package #03 documents. 	
32D Sodding (Ellsworth)	\$4,298
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Ellsworth, for this trade contract. Scope includes the entirety of trade contract 32D as detailed in Bid Package #03 documents. 	
32B Storm Sewer Systems (Hook Construction)	\$214,000
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Hook Construction, for this trade contract. Scope includes the entirety of trade contract 33B as detailed in Bid Package #03 documents. Apparent low bidder was Ellsworth construction. Ellsworth did not include additional storm piping added in Addendum #2 and is considered non-responsive. 	

Please contact me should you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Lockwood', written over the printed name.

Justin Lockwood
Director of Preconstruction
Crossland Construction Company

Enc: Bid Tab & Cost Summary and Divisional Bid Tabs

EXHIBIT B
GMP AMENDMENT NO. 3
LIST OF DRAWINGS/SPECIFICATIONS/ADDENDA

LIST OF DRAWINGS

C6.0 Paving General Layout
 C6.1 Paving Plan and Profile
 C6.2 Storm Sewer Plan & Profile Line A
 C6.3 Paving Details
 C6.4 Paving RCB Details
 C6.5 Storm Sewer Details

LIST OF SPECIFICATIONS

Division 1 - General:

01050 Field Engineering
 01152 Application for Payment 2
 01200 Project Meetings
 01340 Submittals
 01380 Pre-Construction Photographs
 01500 Temporary Facilities and Controls
 01510 Site Access
 01700 Contract Closeout
 01720 Project Record Documents
 01730 Operation and Maintenance Data

Division 2 - Site Work:

02000 Site Work
 02070 Selective Demolition
 02100 Site Preparation
 02211 Rough Grading
 02220 Earthwork
 02265 Finish Grading
 02400 Site Drainage
 02445 Vinyl Coated Chain Link Fencing
 02810 Irrigation
 02934 Sodding
 02939 Sprigging

Division 3 - Concrete:

03100 Concrete Formwork
 03210 Steel Reinforcement
 03300 Cast-In-Place Concrete
 03345 Concrete Finishing

Division 7 – Moisture Protection:

07900 Sealants

Structural Specifications:

- Table of Contents
 042200 Concrete Unit Masonry
 061000 Rough Carpentry
 061753 Shop Fabricated Wood Trusses

**EXHIBIT B
GMP AMENDMENT NO. 3**

LIST OF ADDENDA

CM Addendum #1 dated 12/19/2022
CM Addendum #2 dated 12/20/2022

OTHER CONTRACT DOCUMENTS

Crossland Construction Bid Package #3, Dated 12/1/2022
CEC Geotech Report Dated 6/2/2022

**EXHIBIT C
GMP AMENDMENT NO. 3**

LIST OF ALLOWANCES

No Allowances.

**EXHIBIT D
GMP AMENDMENT NO. 3**

Assumptions

No Assumptions.

**EXHIBIT E
GMP AMENDMENT NO. 3**

GMP Summary

Griffen Park East Road			
Bid Package # 3		CROSSLAND	
Bid Tab		CONSTRUCTION COMPANY, INC.	
Griffen Park East Road		Bid Package # 3	Subcontractor
Date:	1/13/2023		
BP#	Description	Bid Price	Subcontractor
31A	Earthwork	\$ 85,276	Ellsworth
32A	Site Concrete	\$ 64,600	Turning Point
32B	Asphalt	\$ 150,200	Turning Point
32D	Landscape, Irrigation, & Plantings	\$ 4,298	Ellsworth
33B	Storm Sewer Systems	\$ 214,000	Hook
	Subtotal Direct Costs	\$ 518,374	
	Construction Contingency	\$ 25,919	
	Insurance	\$ 3,888	
	Construction Phase Fee	\$ 20,009	
Construction Total		\$ 568,189	

City of Norman
Griffin Park Phase 6-B

GMP Amendment No. 3

EXHIBIT E GMP AMENDMENT NO. 3

Bid Tab

31A Earthwork								
Trade Contractor - Bid Summary								
Contractor:	Hook	Ellsworth	K&M	D Owen	Hammer			
Base Bid:	\$ 132,000	\$ 85,276	\$ 131,274	\$ 120,000	\$ 140,000			
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total:								
Crossland Construction Recommendation								
Recommended Trade Contractor						Price		
BASE BID :	Ellsworth					\$	85,276.00	
TOTAL ALT:								

Trade Contract Identification								
32A Site Concrete								
Trade Contractor - Bid Summary								
Contractor:	Crossland	Turning Point	Connelly	Ellsworth	Rudy			
Base Bid:	\$ 145,000	\$ 64,600	\$ 69,780	\$ 121,285	\$ 91,000			
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total:								
Crossland Construction Recommendation								
Recommended Trade Contractor						Price		
BASE BID :	Turning Point				\$	64,600.00		
TOTAL ALT:								

Trade Contract Identification								
32B Asphalt								
Trade Contractor - Bid Summary								
Contractor:	Connelly	Ellsworth	Rudy	Turning Point				
Base Bid:	\$ 154,960	\$ 196,548	\$ 195,000	\$ 150,200				
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total:								
Crossland Construction Recommendation								
Recommended Trade Contractor						Price		
BASE BID :	Turning Point				\$	150,200.00		
TOTAL ALT:								

City of Norman
Griffin Park Phase 6-B

GMP Amendment No. 3

EXHIBIT E GMP AMENDMENT NO. 3

Bid Tab

Trade Contract Identification								
32D Landscape, Irrigation & Plantings								
Trade Contractor - Bid Summary								
Contractor:	Ellsworth	Greenshade						
Base Bid:	\$ 4,298	\$ 80,367						
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total:								
Crossland Construction Recommendation								
Recommended Trade Contractor			Price					
BASE BID :			Ellsworth \$ 4,297.60					
TOTAL ALT:								

33B Storm Sewer Systems								
Trade Contractor - Bid Summary								
Contractor:	Hammer	Young	Hook	Ellsworth				
Base Bid:	\$ 267,375	\$ 230,000	\$ 214,000	\$ 112,665				
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total:								
Crossland Construction Recommendation								
Recommended Trade Contractor			Price					
BASE BID :			Hook \$ 214,000.00					
TOTAL ALT:								

Missed ODOT Scope

**EXHIBIT F
GMP AMENDMENT NO. 3**

SUBSTANTIAL COMPLETION

Substantial Completion date for Griffin Park Phase 6 is August 30th of 2023.

**EXHIBIT G
GMP AMENDMENT NO. 3**

ACCEPTANCE PERIOD

1. Acceptance of GMP No. 3 is required on or before February 15th, 2023
2. Should the pricing and terms of the GMP Amendment No. 3 not be accepted prior to the above referenced date, the pricing for the scope of work included with GMP Amendment No. 3 will be null and void and the work will be re-advertised and re-bid.

File Attachments for Item:

18. CONSIDERATION OF AWARDING, APPROVAL, ADOPTION, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID 2223-36 AND CONTRACT K-2223-72: A CONTRACT BY AND BETWEEN CITY OF NORMAN AND STRONGHOLD CONSTRUCTION L.L.C., IN THE AMOUNT OF \$875,334, PERFORMANCE BOND B-2223-42, STATUTORY BOND B-2223-43, MAINTENANCE BOND MB-2223-39, FOR THE TRANSIT CENTER REMODEL PROJECT, RESOLUTION R-2223-71 GRANTING TAX-EXEMPT STATUS, AND BUDGET TRANSFER AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Taylor Johnson, Transit and Parking Program Manager

PRESENTER: Shawn O'Leary, Public Works Director

ITEM TITLE: CONSIDERATION OF AWARDING, APPROVAL, ADOPTION, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF BID 2223-36 AND CONTRACT K-2223-72: A CONTRACT BY AND BETWEEN CITY OF NORMAN AND STRONGHOLD CONSTRUCTION L.L.C., IN THE AMOUNT OF \$875,334, PERFORMANCE BOND B-2223-42, STATUTORY BOND B-2223-43, MAINTENANCE BOND MB-2223-39, FOR THE TRANSIT CENTER REMODEL PROJECT, RESOLUTION R-2223-71 GRANTING TAX-EXEMPT STATUS, AND BUDGET TRANSFER AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.

BACKGROUND:

The City of Norman took over the operations of the City public transportation system on June 1, 2019, from the University of Oklahoma. Since then, staff has worked diligently to maintain operation of the service and to evaluate how to better serve Norman's citizens. This work has included collaborating with EMBARK for day to day operations, pursuing grant opportunities to maximize local funding, and developing and implementing the Go Norman Transit Plan.

During the education campaign for the Public Transit Sales Tax in September-November 2019, staff heard from the community and Council about the need to update our long-term vision for the transit system in Norman since the City took over operations.

Using Request for Qualifications (RFQ) Number 1920-60, City staff solicited proposals to update the City's Long Range Transit Plan. There were many key objectives proposed in RFQ-1920-60, with one being "provide recommendations on a new transfer station location/area and recommend route changes to accommodate the new location/area". An evaluation committee made up of City staff, stakeholders, and community members scored and ranked the proposals received in response to RFQ-1920-60. At the conclusion of the evaluation process, Nelson\Nygaard Consulting Associates, Inc. (Nelson\Nygaard) was selected as the most qualified firm for the proposed project.

Project kickoff occurred in August 2020 and following an 11-month process of evaluation, including receiving community and stakeholder feedback, the Go Norman Transit Plan was developed. The finalized plan, which was unanimously adopted by Council on June, 22, 2021,

serves as a guide for improving Norman's public transportation system in the immediate, near, and long term. Along with evaluations of the existing route system and fare analysis, the plan made recommendations for location of a new transit center, route changes and expansions, bus stop locations, and capital replacement. An adopted, current plan also makes the City more competitive with securing grant funding for improvements.

The City has made progress on multiple projects that work towards the initial recommendations in the Go Norman Transit Plan. Those concerning the proposed new transit center include the following:

Evaluation and acquisition of property at 320 East Comanche Street, to be renovated as the new City Transit Center. Council approved a purchase sale agreement for the property on January 19, 2022 and the City assumed ownership on March 4, 2022.

Council then approved a contract with McKinney Architects to provide Architectural and Engineering services for the property on May 10, 2022.

In order to integrate the property at 320 E. Comanche into the recommendations of the Go Norman Transit Plan, a contract amendment with Nelson/Nygaard was proposed and approved by Council on March 8, 2022. This work included updating the system and route maps to realign with the new property, develop transit center bus bay requirements and transfer matrix, develop a new downtown transit center map, and to assist with identifying potential transit center amenities. This work was completed and presented to the City Council Community Planning and Transportation Committee on June 23, 2022. Separate from this amendment, Nelson/Nygaard provided technical expertise to the architect for the transit center renovations.

Throughout fall 2022, Staff worked with the architect to finalize designs. Once finalized in December 2022, bid documents were solicited and a mandatory pre-bid meeting was conducted.

On January 4, 2023, the City of Norman opened bids for the City Transit Center Remodel project. The low bid, from Stronghold Construction, was \$875,334. This was \$322,750.91 over the remaining project budget, which had included the land purchase and architectural services.

DISCUSSION:

The City Transit Center Remodel project includes retrofitting the existing facility to provide restrooms and a breakroom for operators, as well as a restroom and indoor waiting area for the public (with access to vending machines and water). Exterior modifications include making sure the drive through and parking areas are accessible for the large buses, proper site circulation for pedestrians, and amenities such as trash cans, benches and shelters.

Proposed improvements align with the Go Norman Transit Plan and would provide additional amenities for passengers and staff at the current transit hub, the Brooks Street Transfer Station.

The bid documents and specifications for the construction of the City Transit Center Remodel Project were advertised on December 8 and 15, 2022 according to State Law. Four (4) bids were received on January 4, 2023. Upon receipt of the bid proposals, The McKinney Partnership Architects, the design consultant for the project, analyzed the bids and found no errors.

There were three bid alternates considered for the addition of a complete roof replacement, a complete HVAC replacement, and adding an exterior bus shelter respectively. Based on the bid amounts, all alternates are recommended to be included in the contract along with the base bid. Including Alternates 1 and 2 in the project would assist the City in facility maintenance costs. Including Alternate 3 would make the facility more passenger friendly in inclement weather, if for some reason the interior lobby were closed or full of other passengers.

The low bidder for the recommended base bid and alternates is Stronghold Construction, LLC in the amount of \$875,334, which is \$92,126 less than the next lowest bidder. The consultant's final estimate for the project is \$1,161,692.98, approximately 25% more than the low bid. Staff has done a comparative analysis of these bids, and believes the low bid is competitive and fair. Stronghold Construction, LLC employees and staff have completed several comparable construction projects within Oklahoma and has met the bidding requirements set forth in the bid documents.

The remaining budget for this project is \$677,804.88 after land acquisition, architectural and engineering services, and miscellaneous other costs. The allocations made to this project were completed before a site was finalized and costs began to be estimated. Based on the actual bids and other cost estimates, a total project budget of \$1,000,555.79 is needed to cover all anticipated project costs. A project budget breakdown is shown in the table below:

Projected Remaining Costs		
Remodel Bid Amount	\$875,274.00	Actual
Project Sign (Image 360)	\$1,000.00	Estimated
Access Control & CCTV (Convergint)	\$26,655.02	Estimated
FF&E	\$30,000.00	Estimated
Fiber Connection (Trans-Tel)	\$19,981.26	Estimated
Change orders and Contingency (5%)	\$47,645.51	Estimated
Total Project Cost	\$1,000,555.79	

If the contract is awarded, an additional \$323,098.91 in funds will be required to cover the projected remaining costs of the project. \$180,000 of this additional cost is available to be transferred from the Transit and Parking Fund, Fleet Internal Service Fleet Parts (account 27550276-43802). The remaining additional funding need of \$143,098.91 is requested to be appropriated from Capital Fund balance (account 50-29000).

RECOMMENDATION No. 1:

Staff recommends a transfer of \$180,000 from Transit Fleet Internal Service Fleet Parts (account 27550276-43802) and an appropriation of \$143,098.91 from the Capital Fund Balance (50-29000), to the Capital Fund, City Transit Center Remodel, Construction (Account 50593379-46101; Project BG0254).

RECOMMENDATION No. 2:

Staff further recommends Bid Number 2223-36, for the City Transit Center Remodel Project, be awarded to the selected bidder, Stronghold Construction, LLC of Oklahoma City, Oklahoma for \$875,274 for the Base Bid and Bid Alternates 1, 2, and 3.

RECOMMENDATION No. 3:

Staff further recommends that, upon approval of Bid 2223-36, the following contract and bonds be approved:

Contract K-2223-72,
Performance Bond B-2223-42,
Statutory Bond B-2223-43 and
Maintenance Bond MB-2223-39

RECOMMENDATION No. 4:

Staff further recommends that, upon approval of Bid 2223-36, Stronghold Construction, LLC be authorized and appointed as Project Agent via Resolution R-2223-71 to avoid the payment of sales taxes on materials purchases related to the project.

BID RECORD
City of Norman

Item 18.

BID: 2223-36

TITLE: TRANSIT CENTER REMODEL

DATE: 1/4/2023

BIDDER NAME	BASE BID	ALTERNATE No. 1	ALTERNATE No. 2	ALTERNATE No. 3	
1. TCS Construction	\$ 736,600.00	\$ 162,300.00	\$ 31,000.00	\$ 42,000.00	\$ 971,900
2. WLM General Contractor	\$ 748,000.00	\$ 186,000.00	\$ 29,000.00	\$ 43,000.00	\$ 1,006,000
3. Stronghold Const	\$ 625,400.00	\$ 149,892.00	\$ 58,542.00	\$ 41,500.00	\$ 875,334
4. A+H Inc	\$ 687,000.00	\$ 183,400.00	\$ 30,000.00	\$ 67,000.00	\$ 967,400
5.	\$	\$	\$	\$	\$
6.	\$	\$	\$	\$	\$
7.	\$	\$	\$	\$	\$
8.	\$	\$	\$	\$	\$
9.	\$	\$	\$	\$	\$
10.	\$	\$	\$	\$	\$
11.	\$	\$	\$	\$	\$
12.	\$	\$	\$	\$	\$
13.	\$	\$	\$	\$	\$

Received and Opened by:

Esther N Rojo

Date:

1.4. 2023



Mr. Taylor S. Johnson
Transit and Parking Program Manager
City of Norman
1310 Da Vinci Street
Norman, Oklahoma 73069

Tuesday, January 17, 2023

Project: BG0254 Norman Transit Center at 318 E. Comanche
Subject: Evaluation & Recommendation – Bid #2223-36

Mr. Johnson,

As requested, attached please find our tabulation of the bids as received at 2:00 PM on January 4, 2023, for the construction of the Norman Transit Center, located at 318 E. Comanche. Below is our evaluation and recommendation:

In total, four (4) bids were received from prospective bidders with the bid from Stronghold Construction, LLC of Warr Acres, Oklahoma being the apparent lowest and best bid, as follows:

Base Bid:	\$625,400.00	
Alternate 01:	\$149,892.00	115 mil TPO Fleeceback roof
Alternate 02:	\$58,542.00	Mechanical system
Alternate 03:	\$41,500.00	Outdoor Covered Seating

Given our understanding of the Owner's budget for this project and the high volatility observed in the construction market, our office recommends acceptance of the base bid plus all three (3) Alternates for a Bid Total of \$875,334.00.

Should you have any further questions, please feel free to contact me at (405) 360-1400 or mckinney@tmparch.com.

Respectfully,

Richard S. McKinney Jr., AIA
President

Attachments: Bid Tabulation Form

3600 West Main
Suite 200
Norman, Oklahoma
73072
405.360.1400 p
405.364.8287 f
tmparch.com

BID TABULATION FORM

CITY OF NORMAN – 201 WEST GRAY STREET – January 4, 2023 – 2:00 PM

Bidder	Bid Amounts		Total Bid
A/Engineer Estimate	Base Bid	\$829,908.00	\$1,035,532.00
White & Associates	Alternate 01:	\$121,424.00	
	Alternate 02:	\$84,220.00	
	Alternate 03:	\$0.00	
TCS Construction	Base Bid	\$736,600.00	\$ 971,000.00
	Alternate 01:	\$162,300.00	
	Alternate 02:	\$31,000.00	
	Alternate 03:	\$42,000.00	
Anderson & House	Base Bid	\$687,000.00	\$ 967,400.00
Construction	Alternate 01:	\$183,400.00	
	Alternate 02:	\$30,000.00	
	Alternate 03:	\$67,000.00	
Stronghold	Base Bid	\$625,400.00	\$ 875,334.00
Construction	Alternate 01:	\$149,892.00	
	Alternate 02:	\$58,542.00	
	Alternate 03:	\$41,500.00	
W.L. McNatt & Co.	Base Bid	\$748,000.00	\$1,006,000.00
Construction	Alternate 01:	\$186,000.00	
	Alternate 02:	\$29,000.00	
	Alternate 03:	\$67,000.00	

CONTRACT

Item 18.

THIS CONTRACT made and entered into this 14th day of February, 2023, by and between Stronghold Construction LLC as Party of the First Part, hereinafter designated as the CONTRACTOR, and the City of Norman, a municipal corporation, hereinafter designated as the CITY, Party of the Second Part.

WITNESSETH

WHEREAS, the CITY has caused to be prepared in accordance with law, specifications, and other bidding documents for the work hereinafter described and has approved and adopted all of said bidding documents, and has caused Notice to Bidders to be given and advertised as required by law, and has received sealed proposals for the furnishing of all labor and materials for the following projects:

BID 2223-36 Norman Transit Center

as outlined and set out in the bidding documents and in accordance with the terms and provisions of said CONTRACT; and,

WHEREAS, the CONTRACTOR in response to said Notice to Bidders, has submitted to the CITY in the manner and at the time specified, a sealed proposal in accordance with the terms of this Contract; and,

WHEREAS, the CITY, in the manner provided by law, has publicly opened, examined, and canvassed the proposals submitted and has determined and declared the above-named CONTRACTOR to be the lowest and best Bidder on the above-prepared project, and has duly awarded this CONTRACT to said CONTRACTOR, for the sum named in the proposal, to wit:

EIGHT HUNDRED SEVENTY-FIVE THOUSAND THREE HUNDRED THIRTY FOUR Dollars;

(\$875,334.00).

NOW, THEREFORE, for and in consideration of the mutual agreements and covenants herein contained, the parties to this CONTRACT have agreed, and hereby agree, as follows:

1) The CONTRACTOR shall, in a good and first-class, workman-like manner at his own cost and expense, furnish all labor, materials, tools, and equipment required to perform and complete said work in strict accordance with this CONTRACT and the following CONTRACT Documents: The Bid Notice published in the Norman Transcript, the Notice to Bidders, Instructions to Bidders, the Contractor's Bid or Proposal, the Construction Drawings, Specifications, Provisions, and Bonds thereto, all of which documents are on file in the Office of the Purchasing Agent of the City of Norman, and are made a part of this CONTRACT as fully as if the same were set out at length.

Contract No. K-2223-72

Page 1 of 4

2) The CITY shall make payments as stipulated in the contract documents to the CONTRACTOR in the following manner: On or about the first day of each month, the project engineer, or other appropriate person, will make accurate estimates of the value, based on CONTRACT prices, or work done, and materials incorporated in the work and of materials suitably stored at the site thereof during the preceding calendar month. The CONTRACTOR shall furnish to the project engineer, or other appropriate person, such detailed information as he may request to aid him as a guide in the preparation of the monthly estimates.

Each monthly estimate for payment must contain or have attached an affidavit in accordance with the Constitution of the State of Oklahoma, Title 62, Section 310.9.

On completion of the work, but prior to the acceptance thereof by the CITY, it shall be the duty of the project engineer, or other appropriate person, to determine that said work has been completely and fully performed in accordance with said CONTRACT Documents; and upon making such determinations, said official shall make his final certificate to the CITY.

The CONTRACTOR shall furnish proof that all claims and obligations incurred by him in connection with the performance of said work have been fully paid and settled; said information shall be in the form of an affidavit, which shall bear the approval of the surety on the CONTRACT Bonds for payment of the final estimate to the CONTRACTOR; thereupon, the final estimate (including retainages) will be approved and paid.

3) It is further agreed that the CONTRACTOR will commence said work within 10 days following receipt of a NOTICE-TO-PROCEED, and prosecute the same vigorously and continuously. Any suspension of work must be approved by the engineer or the engineer's representative. The contract period is as follows:

NORMAN TRANSIT CENTER

120 Calendar Days

1. 120 Calendar Days does not include weather days

i) Weather days to be determined by the transit and parking program manager

4) That the CITY shall pay the CONTRACTOR for the work performed as follows:

- a. Payment for unit price items shall be at the unit price bid for actual construction quantities.
- b. Construction items specified but not included as bid items shall be considered incidental and shall not be paid for directly, but shall be included in the bid price for any or all of the pay quantities.
- c. Should any defective work or materials be discovered or should a reasonable doubt rise as to the quality of any work completed, there will be deducted from the next estimate an amount equal to the value of the defective or questionable work and shall not be paid until the defects are remedied.
- d. And that the CONTRACTOR'S bid is hereby made a part of this Agreement.

5) The amount of retainage with respect to progress payments will be 5%.

6) That the CONTRACTOR will not undertake to furnish any materials or to perform any work not specifically authorized under the terms of this Agreement unless additional materials or work are authorized by written Change Order, executed by the CITY; and that in the event any additional are provided by the CONTRACTOR without such authorization, the CONTRACTOR shall not be entitled to any compensation therefore whatsoever.

Contract No. K-2223-72

Page 2 of 4

7) That if any additional work is performed or additional materials provided by the CONTRACTOR upon authorization by the CITY, the CONTRACTOR shall be compensated therefore at the unit price and as agreed to by both parties in the execution of the Change Order.

8) That the CONTRACTOR shall perform the work and provide the materials strictly in accordance with the specifications as to quality and kind, and all work and materials shall be subject to rejection by the CITY through its authorized representatives for failure to meet such requirements, and in the event of such rejection, the CONTRACTOR shall replace the work and materials without compensation therefore by the CITY.

9) The CONTRACTOR shall complete the work in accordance with the terms of this Agreement. The CONTRACTOR further agrees to pay liquidated damages, as stipulated in the contract document and the General Conditions included in the City of Norman Standard Specifications and Construction Drawings, for each calendar day thereafter.

10) The CONTRACTOR shall furnish surety bonds and certificate of insurance as specified herein which bonds and insurance must be approved by the CITY prior to issuance of the Work Order and commencement of work on the project. The CONTRACTOR shall provide written documentation from the Maintenance Bond Company that all work, including Change Orders, is covered by the Maintenance Bond before final acceptance of the project.

11) IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed, in three (3) duplicate originals, the day and year first above written.

12) To that end, no provision of this CONTRACT or of any such aforementioned document shall be interpreted or given legal effect to create an obligation on the part of the CITY to third persons, including, by way of illustration but not exclusion, sureties upon performance bonds, payment bonds or other bonds, assignees of CONTRACTOR, subcontractors, and persons performing labor, furnishing material or in any other way contributing to or assisting in the performance of the obligations of the CONTRACTOR; nor shall any such provisions be interpreted or given legal effect to afford a defense against any obligation owed or assumed by such third person to the CITY or in any way to restrict the freedom of the third person to the CITY or in any way to restrict the freedom of the CITY to exercise full discretion in its dealing with the Contractor.

13) The sworn, notarized statement below must be signed and notarized before this Contract will become effective.

STATE OF Oklahoma)
COUNTY OF Cleveland) ss:

Zach Simmons, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by CONTRACTOR to submit the above CONTRACT to the CITY. Affiant further states that CONTRACTOR has not paid, given or donated or agreed to pay, give, or donate to any officer or employee of the CITY any money or other thing of value, either directly or indirectly, in the procuring of the CONTRACT.


Contractor

Contract No. K-2223-72
Page 3 of 4

Subscribed and sworn to before me this 8 day of February, 2023

Item 18.



Danielle Clark
Notary Public

IN WITNESS WHEREOF, the said parties of the First and Second Part have hereunto set their hands and seals respectively the 8 day of February 2023, and the _____ day of _____, 20____.

(Corporate Seal) (where applicable)

ATTEST:
Authorized Representative

Corporate Secretary (where applicable)

Principal

Signed: [Signature]

Title: President

Address 3431 N. MacArthur Blvd
Warr Acres, OK 73122

Telephone: 405 871-5760

CITY OF NORMAN:

Approved as to form and legality this 8th day of February 2023.

[Signature]
City Attorney

Approved by the Council of the City of Norman, this _____ day of _____, 20____.

ATTEST:

City Clerk

Mayor

Contract No. K-2223-72
Page 4 of 4

CONTRACT AFFIDAVIT

STATE OF Oklahoma)
COUNTY OF Cleveland) ss:

Zach Simmons, of lawful age, being first duly sworn, on oath says that (s)he is the Agent authorized by the Firm of Stronghold Construction to submit the above Contract to the City of Norman, Oklahoma.

Affiant further states that such firm has not paid, given or donated or agreed to pay, give, or donate to any officer or employee of the City of Norman, Oklahoma, any money or other thing of value, either directly or indirectly, in the procuring of the Contract.

Zach Simmons
Contractor

Subscribed and sworn to before me this 8 day of February, 2023.

Danielle Clark
Notary Public

My Commission Expires:



PERFORMANCE BOND

Item 18.

Know all men by these presents, that Stronghold Construction LLC as PRINCIPAL, and RLI Insurance Company, a Corporation organized under the laws of the State of Illinois and authorized to transact business in the State of Oklahoma, as SURETY, are held and firmly bound unto THE CITY OF NORMAN, a Municipal Corporation of the State of Oklahoma, herein called CITY, in the sum of EIGHT HUNDRED SEVENTY-FIVE THOUSAND THREE HUNDRED THIRTY FOUR dollars (\$875,334.00), for the payment of which sum PRINCIPAL and SURETY bind themselves, their heirs, executors, administrators, successors and assigns jointly and severally.

WHEREAS, the conditions of this obligation are such that the PRINCIPAL, being the lowest and best Bidder on the following PROJECT:

BID 2223-36 Norman Transit Center

has entered into a written CONTRACT (K-2223-72) with THE CITY OF NORMAN, dated this 14th day of February, 2023 for the erection and construction of this PROJECT, that CONTRACT being incorporated herein by reference as if fully set forth.

NOW, THEREFORE, if PRINCIPAL shall, in all particulars, well and truly perform and abide by said CONTRACT and all specifications and covenants thereto; and if the PRINCIPAL shall promptly pay or cause to be paid all indebtedness incurred for labor and materials and repairs to and parts for equipment furnished in the making of this PROJECT, whether incurred by the PRINCIPAL or subcontractors; and if the PRINCIPAL shall protect and hold harmless the CITY from all loss, damage, and expense to life or property suffered or sustained by any person, firm, or corporation caused by PRINCIPAL or his or its agents, servants, or employees in the construction of the PROJECT, or by or in consequence of any negligence, carelessness or misconduct in guarding and protecting the same, or from any act or omission of PRINCIPAL of his or its agents, servants, or employees; and if the PRINCIPAL shall protect and save the CITY harmless from all suits and claims of infringement or alleged infringement or patent rights or processes, then this obligation shall be null and void. Otherwise this obligation shall remain in full force and effect.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in the CONTRACT and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the sureties, or any of them, from the obligations of this Bond.

It is further expressly agreed that the Principal's obligations under this Bond include payment of not less than the prevailing hourly rate of wages as established by the Commissioner of Labor of the State of Oklahoma and by the Secretary of the U.S. Department of Labor or as determined by a court on appeal.

IN WITNESS WHEREOF, the PRINCIPAL has caused these presents to be executed in its name and its corporate seal (where applicable) to be hereunto affixed by its duly authorized representative(s), and the 6 day of February, 2023 and the SURETY has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its authorized representative(s) on the day of February 6, 2023.

Performance Bond No. B-2223-42
Page 1 of 3

(Corporate Seal) (where applicable)

ATTEST:

Corporate Secretary (where applicable)

Principal Stronghold Construction, LLC
 Signed: [Signature]
 Title: President

Address: 3431 N MacArthur Blvd
Oklahoma City, OK 73122
 Telephone: 405-725-8050

(Corporate Seal) (where applicable)

ATTEST: Vicki Wilson
 Vicki Wilson, Witness

Surety: RLI Insurance Company
 Signed: Carey L. Kennemer
 Authorized Representative
 Printed: Carey L. Kennemer
 Authorized Representative

Title: Attorney-in-Fact
 Address: 9025 N Lindberg Dr, Peoria, IL 61615
 Telephone: 405-418-8600

CORPORATE ACKNOWLEDGEMENT

STATE OF Oklahoma)
 COUNTY OF Cleveland) ss:

The foregoing instrument was acknowledge before me this 8 day of February, 2023 by Zachary Simmons, President (Name and Title), of Stronghold Construction, a(n) corporation, on behalf of the corporation.

WITNESS my hand and seal this 8 day of February, 2023.

[Signature]
 Notary Public

My Commission Expires:



Performance Bond No. B-2223-42
 Page 2 of 3

INDIVIDUAL ACKNOWLEDGEMENT

STATE OF _____)
) ss:
 COUNTY OF _____)

The foregoing instrument was acknowledge before me this _____ day of _____, 20____,
 by _____ (Name and Title) of _____,
 a(n) corporation.

WITNESS my hand and seal this _____ day of _____, 20__.

 Notary Public

My Commission Expires:

PARTNERSHIP ACKNOWLEDGEMENT

STATE OF _____)
) ss:
 COUNTY OF _____)

The foregoing instrument was acknowledge before me this _____ day of _____, 20____,
 by _____ (Name and Title) _____
 (partner/agent) on behalf of _____, a partnership.

WITNESS my hand and seal this _____ day of _____, 20__.

 Notary Public

My Commission Expires:

CITY OF NORMAN

Approved as to form and legality this 8th day of February, 2023.

Herb Hale
 City Attorney

Approved by the Council of the City of Norman this _____ day of _____, 20__.

ATTEST:

 City Clerk

 Mayor

Performance Bond No. B-2223-42
 Page 3 of 3

**CITY OF NORMAN
MAINTENANCE BOND**

Item 18.

Know all men by these presents that Stronghold Constrction LLC, as Principal, and RLI Insurance Company, a corporation organized under the laws of the State of Illinois, and authorized to transact business in the State of Oklahoma, as SURETY, are held and firmly bound unto THE CITY OF NORMAN, a Municipal Corporation of the State of Oklahoma, herein called CITY, in the sum of EIGHT HUNDRED SEVENTY-FIVE THOUSAND THREE HUNDRED THIRTY FOUR dollars (\$875,334.00), such sum being equal to the contract price and being in force for a period of one year from the date of the acceptance of the below described improvements by the City Council, and thereafter for the sum of N/A DOLLARS(\$), such sum being not less than fifteen percent (15%) of the total contract price of said improvements for a period of N/A years thereafter, for the payment of which sum PRINCIPAL and SURETY bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

WHEREAS, the conditions of this obligation are such that the PRINCIPAL, being the lowest and best bidder on the following project:

BID 2223-36 Norman Transit Center

has entered into a written CONTRACT (K-2223-72) with the CITY OF NORMAN, dated this 14th day of February, 2023, for the erection and construction of this PROJECT, that CONTRACT being incorporated herein by references as if fully set forth; and,

WHEREAS, under the ordinances of the CITY the PRINCIPAL is required to furnish to the CITY a maintenance bond covering said construction of this PROJECT, the bond to include the terms and provisions hereinafter set forth, as a condition precedent to final acceptance of the PROJECT.

NOW, THEREFORE, if the PRINCIPAL shall keep and maintain, subject to normal wear and tear, the construction, except for defects not occasioned by improper workmanship, materials, or failure to protect new work until it is accepted, and if the PRINCIPAL shall promptly repair, without notice from the CITY or expense to the CITY any and all defects arising from improper workmanship, materials, or failure to protect new work until it is accepted; all for a period of one (1) year from the date of the written final acceptance by the CITY, then this obligation shall be null and void. The amount of the Maintenance Bond shall be 100 % of the contract amount. Otherwise, this obligation shall remain in full force and effect at all times.

Provided further, however, that upon neglect, failure or refusal of the PRINCIPAL to maintain or make any needed repairs upon the construction on the PROJECT, as set out in the preceding paragraph, within ten (10) days after the mailing of notice to the PRINCIPAL by letter deposited in the United States Post Office at Norman, Oklahoma, addressed to the PRINCIPAL at the address set forth below, then the PRINCIPAL and SURETY shall jointly and severally be liable to the CITY for the cost and expense for making such repair, or otherwise maintaining the said construction.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in said CONTRACT and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the sureties, or any of them, from the obligations of this Bond.

Maintenance Bond No. MB-2223-4
Page 1 of 3

IN WITNESS WHEREOF, the said PRINCIPAL has caused these presents to be executed in its name and its corporate seal (where applicable) to be hereunto affixed by its duly authorized representative(s), on the 6 day of February, 2023, and the SURETY has caused these presents to be executed in its name its corporate seal to be hereunto affixed by its authorized representative(s) on the 6th day of February, 2023.

(Corporate Seal) (where applicable)

ATTEST:

Principal

Stronghold Construction, LLC

Signed:

Authorized Representative

Title:

President

Corporate Secretary (where applicable)

Address: 3431 N MacArthur Blvd

Oklahoma City, OK 73122

Telephone: 405-725-8050

(Corporate Seal) (where applicable)

ATTEST:

Vicki Wilson

Vicki Wilson, Witness

Surety: RLI Insurance Company

Signed:

Carey L. Kennemer

Authorized Representative

Printed: Carey L. Kennemer

Authorized Representative

Title:

Attorney-in-Fact

Address: 9025 N Lindberg Dr, Peoria, IL 61615

Telephone: 405-418-8600

CORPORATE ACKNOWLEDGEMENT

STATE OF Oklahoma)

) ss:

COUNTY OF Cleveland)

The foregoing instrument was acknowledge before me this 8 day of February, 2023, by Zachary Simmons, President (Name and Title), of Stronghold Construction a(n) corporation, on behalf of the corporation.

WITNESS my hand and seal this 8 day of February, 2023

Danielle Clark
Notary Public

My Commission Expires:



Maintenance Bond No. MB-2223-39

Page 2 of 3

INDIVIDUAL ACKNOWLEDGEMENT

STATE OF _____)
) ss:
 COUNTY OF _____)

The foregoing instrument was acknowledge before me this _____ day of _____, 20____, by
 _____ (Name and Title) of _____,
 a(n) corporation.

WITNESS my hand and seal this _____ day of _____, 20____.

 Notary Public

My Commission Expires:

PARTNERSHIP ACKNOWLEDGEMENT

STATE OF _____)
) ss:
 COUNTY OF _____)

The foregoing instrument was acknowledge before me this _____ day of _____, 20____, by
 _____ (Name and Title) _____ (partner/agent)
 on behalf of _____, a partnership.

WITNESS my hand and seal this _____ day of _____, 20____.

 Notary Public

My Commission Expires:

CITY OF NORMAN

Approved as to form and legality this ^{5th} day of February, 2023

[Signature]
 City Attorney

Approved by the Council of the City of Norman this _____ day of _____, 20____.

ATTEST:

 City Clerk

 Mayor

STATUTORY BOND

Know all men by these presents that Stronghold Construction LLC as PRINCIPAL, and RLI Insurance Company, a corporation organized under the laws of the State Illinois, and authorized to transact business in the State of Oklahoma, as Surety, are held and firmly bound unto the State of Oklahoma in the sum of EIGHT HUNDRED SEVENTY-FIVE THOUSAND THREE HUNDRED THIRTY FOUR dollars (\$875,334.00), or the payment of which sum PRINCIPAL and SURETY bind themselves, their heirs executors, administrators, successors and assigns jointly and severally.

WHEREAS, the conditions of this obligation are such, that the PRINCIPAL, being the lowest and best Bidder on the following PROJECT:

BID 2223-36 Norman Transit Center

has entered into a written CONTRACT (K-2223-72) with THE CITY OF NORMAN, dated this 14th day of February, 2023, for the erection and construction of this PROJECT, that CONTRACT being incorporated herein by reference as if fully set forth.

NOW, THEREFORE, if the PRINCIPAL, shall properly and promptly complete the work on this PROJECT in accordance with the CONTRACT, and shall well and truly pay all indebtedness incurred for labor and materials and repairs to and parts for equipment furnished in the making of the PROJECT, whether incurred by the PRINCIPAL, his subcontractors, or any material men, then this obligation shall be void. Otherwise this obligation shall remain in full force and effect. If debts are not paid within thirty (30) days after the same becomes due and payable, the person, firm, or corporation entitled thereto may sue and recover on this Bond, subject to the provisions of 61 O.S. S2, for the amount so due and unpaid.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in said CONTRACT and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the SURETIES, or any of them, from the obligation of this Bond.

It is further expressly agreed that the Principal's obligations under this Bond include payment of not less than the prevailing hourly rate of wages as established by the Commissioner of Labor of the State of Oklahoma and by the Secretary of the U.S. Department of Labor or as determined by a court on appeal.

IN WITNESS WHEREOF, the PRINCIPAL has caused these presents to be executed in its name and its corporate seal (where applicable) to be hereunto affixed by its duly authorized representative(s), on the 16 day of February, 2023, and the SURETY has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its authorized representative on the 6th day of February, 2023.

(Corporate Seal) (where applicable)

ATTEST

Corporate Secretary (where applicable)

Principal Stronghold Construction, LLC
 Signed: [Signature]
 Title: Authorized Representative

Address: 3431 N MacArthur Blvd

Oklahoma City, OK 73122

Telephone: 405-725-8050

(Corporate Seal) (where applicable)

ATTEST: Vicki Wilson
 Vicki Wilson, Witness

Surety: RLI Insurance Company

Signed: [Signature]
 Authorized Representative

Printed: Carey L. Kennemer
 Authorized Representative

Title: Attorney-in-Fact

Address: 9025 N Lindberg Dr, Peoria, IL 61615

Telephone: 405-418-8600

CORPORATE ACKNOWLEDGEMENT

STATE OF Oklahoma)
) ss:
 COUNTY OF Cleveland)

The foregoing instrument was acknowledged before me this 8 day of February, 2023, by Zachary Simmons, President (Name and Title), of Stronghold Construction a(n) corporation, on behalf of the corporation.

WITNESS my hand and seal this 8 day of February, 2023

[Signature]
 Notary Public

My Commission Expires:



Statutory Bond No. B-2223-43
 Page 2 of 3

INDIVIDUAL ACKNOWLEDGEMENT

STATE OF _____)
) ss
 COUNTY OF _____)

The foregoing instrument was acknowledge before me this _____ day of _____, 20____,
 by _____ (Name and Title) of _____,
 a(n) corporation.

WITNESS my hand and seal this _____ day of _____, 20____.

 Notary Public

My Commission Expires:

Statutory Bond No. B-2223-43
 Page 2 of 3

PARTNERSHIP ACKNOWLEDGEMENT

STATE OF _____)
) ss:
 COUNTY OF _____)

The foregoing instrument was acknowledge before me this _____ day of _____, 20____,
 by _____ (Name and Title) _____
 (partner/agent) on behalf of _____, a partnership.

WITNESS my hand and seal this _____ day of _____, 20____.

 Notary Public

My Commission Expires:

CITY OF NORMAN

Approved as to form and legality this 8th day of February, 2023.

Chris Boale
 City Attorney

Approved by the Council of the City of Norman this _____ day of _____, 20____.

ATTEST:

 City Clerk

 Mayor

Statutory Bond No. B-2223-43
 Page 3 of 3

POWER OF ATTORNEY

RLI Insurance Company Contractors Bonding and Insurance Company

9025 N. Lindbergh Dr. Peoria, IL 61615
Phone: 800-645-2402

Know All Men by These Presents:

That this Power of Attorney is not valid or in effect unless attached to the bond which it authorizes executed, but may be detached by the approving officer if desired.

That **RLI Insurance Company and/or Contractors Bonding and Insurance Company**, each an Illinois corporation, (separately and together, the "Company") do hereby make, constitute and appoint:

Travis E. Brown, Mark D. Nowell, Christopher W. Webb, Ryan N. Teubner, Deborah L. Raper, Kent Jay Bradford, Kyle Pat Bradford, Shelli R. Samsel, Dwight A. Pilgrim, Vicki Wilson, Clayton Howell, Austin Greenhaw, Gary Liles, Randy D. Webb, Bobby Joe Young, Aaron Woolsey, Carey L. Kenneimer, Joshua Bryan, jointly or severally

in the City of Oklahoma City, State of Oklahoma, its true and lawful Agent(s) and Attorney(s) in Fact, with full power and authority hereby conferred, to sign, execute, acknowledge and deliver for and on its behalf as Surety, in general, any and all bonds and undertakings in an amount not to exceed Twenty Five Million Dollars (\$25,000,000.00) for any single obligation.

The acknowledgment and execution of such bond by the said Attorney in Fact shall be as binding upon the Company as if such bond had been executed and acknowledged by the regularly elected officers of the Company.

RLI Insurance Company and/or Contractors Bonding and Insurance Company, as applicable, have each further certified that the following is a true and exact copy of a Resolution adopted by the Board of Directors of each such corporation, and is now in force, to-wit:

"All bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation shall be executed in the corporate name of the Company by the President, Secretary, any Assistant Secretary, Treasurer, or any Vice President, or by such other officers as the Board of Directors may authorize. The President, any Vice President, Secretary, any Assistant Secretary, or the Treasurer may appoint Attorneys in Fact or Agents who shall have authority to issue bonds, policies or undertakings in the name of the Company. The corporate seal is not necessary for the validity of any bonds, policies, undertakings, Powers of Attorney or other obligations of the corporation. The signature of any such officer and the corporate seal may be printed by facsimile."

IN WITNESS WHEREOF, the **RLI Insurance Company and/or Contractors Bonding and Insurance Company**, as applicable, have caused these presents to be executed by its respective Vice President with its corporate seal affixed this 26th day of October, 2022.



**RLI Insurance Company
Contractors Bonding and Insurance Company**

By: Barton W. Davis
Barton W. Davis Vice President

State of Illinois
County of Peoria

} SS

CERTIFICATE

On this 26th day of October, 2022, before me, a Notary Public, personally appeared Barton W. Davis, who being by me duly sworn, acknowledged that he signed the above Power of Attorney as the aforesaid officer of the **RLI Insurance Company and/or Contractors Bonding and Insurance Company** and acknowledged said instrument to be the voluntary act and deed of said corporation.

I, the undersigned officer of **RLI Insurance Company and/or Contractors Bonding and Insurance Company**, do hereby certify that the attached Power of Attorney is in full force and effect and is irrevocable; and furthermore, that the Resolution of the Company as set forth in the Power of Attorney, is now in force. In testimony whereof, I have hereunto set my hand and the seal of the **RLI Insurance Company and/or Contractors Bonding and Insurance Company** this 6th day of February, 2023.

By: Catherine D. Glover
Catherine D. Glover Notary Public

**RLI Insurance Company
Contractors Bonding and Insurance Company**

By: Jeffrey D. Fick
Jeffrey D. Fick Corporate Secretary



Resolution

R-2223-71

A RESOLUTION OF THE COUNCIL OF THE CITY OF
NORMAN, OKLAHOMA, AUTHORIZING AND
APPOINTING STRONGHOLD CONSTRUCTION, L.L.C.,
AS PROJECT AGENT FOR THE NORMAN TRANSIT
CENTER PROJECT IN THE CITY OF NORMAN.

- § 1. WHEREAS, the City of Norman, Oklahoma, does hereby acknowledge that the tax-exempt status of this political subdivision is a significant factor in determining the agreed contract price bid by Stronghold Construction, L.L.C., for the Norman Transit Center Project; and
- § 2. WHEREAS, the City of Norman, Oklahoma, in compliance with State law, desires to confer on Stronghold Construction, L.L.C., its special State and Federal sales tax exemptions and in order to achieve such end, finds it necessary to appoint as its direct purchasing agent, Stronghold Construction, L.L.C., to purchase materials which are in fact used for the Norman Transit Center Project; and
- § 3. WHEREAS, this limited agent status is conferred with the express understanding that Stronghold Construction, L.L.C., shall appoint employees and subcontractors as subagents who shall be authorized to make purchases on their behalf.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 4. That the City of Norman, Oklahoma, on the 14th day of February, 2023, did appoint Stronghold Construction, L.L.C., who is involved in the the Norman Transit Center Project, an agent of the City of Norman, Oklahoma, solely for the purpose of purchasing, on a tax-exempt basis, materials and tangible personal property to be used exclusively for the Norman Transit Center Project.

PASSED AND ADOPTED THIS 14th day of February, 2023.

Mayor

ATTEST:

City Clerk





City Transit Center Remodel Location Map



1200

File Attachments for Item:

19. CONSIDERATION OF ACCEPTANCE, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A FEDERAL TRANSIT ADMINISTRATION 5303 FUNDING GRANT IN THE AMOUNT OF \$40,000 THROUGH THE ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS (ACOG) TO BE USED FOR ELIGIBLE TRANSIT PLANNING ACTIVITIES WITHIN THE CENTRAL OKLAHOMA TRANSPORTATION MANAGEMENT AREA (TMA) AS IDENTIFIED IN THE FY2023 UNIFIED PLANNING WORK PROGRAM (UPWP) AND, APPROVAL OF CONTRACT K-2223-112 WITH DEPOSIT OF FUNDS AS OUTLINED IN THE STAFF REPORT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Taylor Johnson, Transit and Parking Program Manager

PRESENTER: Shawn O'Leary, Director of Public Works

ITEM TITLE: CONSIDERATION OF ACCEPTANCE, APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A FEDERAL TRANSIT ADMINISTRATION 5303 FUNDING GRANT IN THE AMOUNT OF \$40,000 THROUGH THE ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS (ACOG) TO BE USED FOR ELIGIBLE TRANSIT PLANNING ACTIVITIES WITHIN THE CENTRAL OKLAHOMA TRANSPORTATION MANAGEMENT AREA (TMA) AS IDENTIFIED IN THE FY2023 UNIFIED PLANNING WORK PROGRAM (UPWP) AND, APPROVAL OF CONTRACT K-2223-112 WITH DEPOSIT OF FUNDS AS OUTLINED IN THE STAFF REPORT.

BACKGROUND:

The City of Norman took over the operations of the City public transportation system on June 1, 2019, from the University of Oklahoma. On June 27, 2019, the City of Norman was recognized by the Federal Transit Administration (FTA) as an eligible recipient of federal transit funds for the Norman Urbanized Area. As a part of this transition of operations, the City of Norman also replaced the University's CART program for regional transportation planning activities.

The Association of Central Oklahoma Governments (ACOG) serves as the Metropolitan Planning Organization (MPO) for the Central Oklahoma Transportation Management Area (TMA), providing a multi-government, multi-agency body for carrying out a continuing, coordinated, comprehensive program of multimodal transportation system planning. The Unified Planning Work Program (UPWP) is a description of the proposed multimodal transportation planning activities to be conducted in the ACOG MPO area during FY 2023 (July 1, 2022, to June 30, 2023). This program is administered by ACOG, in accordance with a Memorandum of Understanding between ACOG, the Oklahoma Department of Transportation (ODOT), the Central Oklahoma Transportation and Parking Authority (COTPA), and the City of Norman (Norman-Transit).

The UPWP is prepared annually and serves as a basis for requesting federal planning funds from the U.S. Department of Transportation, as well as a management tool for scheduling, budgeting, and monitoring the planning activities of the participating entities. The City of Norman cooperatively works with ACOG, ODOT, and COTPA on the planning efforts outlined in the annual Unified Planning Work Program (UPWP), which includes development and

implementation of the ACOG MPO Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP).

FTA 5303 funds are apportioned to states for metropolitan planning by formula based on proportion of population and then sub-allocated to MPOs. These funds are available for eligible planning activities such as increasing safety and security, supporting economic vitality, and enhancing the integration and connectivity of the transportation system among other eligible activities.

DISCUSSION:

The FY 2023 ACOG MPO UPWP budgets a total of \$50,000 (of which \$40,000 /80% is federal and \$10,000 /20% is local match) in FTA 5303 funding to the City of Norman for Short Range Planning. As outlined in the UPWP, short range planning can include:

- Providing data on route and service changes for the annual Network Monitoring Report;
- Studying alternative modes and alignments and evaluating the same for social, economic, and environmental impacts;
- Evaluating, implementing, and monitoring performance of bus route services and changes and reviewing the impact of any changes;
- Planning for fleet replacement and expansion as necessary for service;
- Developing and maintaining both print and digital route formats of both individual routes and system maps;
- Pursuing marketing strategies to retain and expand ridership such as developing real-time rider tools, advertising implementation of planned service changes, and promoting transit service to the community; and
- Facilitating bus route accessibility by identifying issues, improving accessibility at bus stops, and monitoring deployment of e-scooter technologies to ensure safety for all users of the public right of way.

RECOMMENDATION:

1. Staff recommends accepting the FTA 5303 Grant Funding in the amount of \$40,000 for eligible transit planning activities within the Central Oklahoma Transportation Management Area (TMA) as identified in the FY2023 Unified Planning Work Program (UPWP).
2. Staff recommends approval of contract K-2223-112.
3. Staff recommends recording receipt of the grant of \$40,000 into account 275-333252 (Other Revenue-Federal Grants).



The City of **NORMAN**

201 West Gray, Bldg. A
Norman, Oklahoma 73069

Item 19.

PUBLIC WORKS DEPARTMENT

Phone: (405) 366-5453

Fax: (405) 366-5418

May 9, 2022

Mark W. Sweeney, AICP
Executive Director
4205 N Lincoln Blvd
Oklahoma City, Ok 73105

Dear Mr. Sweeney,

The City of Norman requests to use 5303 funds (FFY 23 \$40,000) for the purpose of grant management, multimodal planning, long-range plan implementation, transit software, related transit consultant work, and other activities as listed in the Unified Planning Work Program.

Sincerely,

Taylor Johnson
Transit and Parking Program Manager

cc: Jason Huff, Transit Planner and Grants Specialist
Shawn O'Leary, P.E., CFM, Director of Public Works
Darrel Pyle, City Manager

CONTRACT
BY AND BETWEEN THE
ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS
AND
THE CITY OF NORMAN

The parties of this Contract are the Association of Central Oklahoma Governments (ACOG) and the City of Norman (NORMAN). The parties may be referred to individually as PARTY or collectively as PARTIES. The parties agree to the following terms and conditions.

The term of this CONTRACT is for Fiscal Year 2023, effective July 1, 2022, and ending on June 30, 2023. This CONTRACT reaffirms the Metropolitan Transportation Planning process in the Central Oklahoma Transportation Management Area (TMA). Frequent reference will be made in this CONTRACT to the Oklahoma Department of Transportation (ODOT) and the Federal Transit Administration (FTA).

ACOG shall award a grant to NORMAN in an amount not to exceed \$40,000. NORMAN shall provide local matching funds of \$10,000.

A. SCOPE OF SERVICES

A.1. Unified Planning Work Program

This CONTRACT provides NORMAN the FTA 5303 funding for transit planning activities within the TMA as identified in the FY 2023 Unified Planning Work Program (UPWP).

A.1.a. The activities to be conducted and financed during the CONTRACT period are prescribed in the FY 2023 UPWP. The UPWP details the tasks, work responsibilities, costs, and funding sources of each activity to be undertaken within the TMA. Approval of the UPWP by the PARTIES, the ACOG MPO PC, and FTA will constitute acceptance of the UPWP as a part of this CONTRACT, subject to the financing provisions of Section B herein.

A.1.b. The grant funds shall be used for the purpose of grant management, multimodal planning, long-range plan implementation, transit software, related transit consultant work, and other activities as listed in the FY 2023 UPWP.

A.2. Funding

The intention of ACOG in awarding these FTA 5303 funds is to maintain the comprehensive, continuing, and cooperative transportation planning process in order to provide the most desirable multimodal transportation system that is compatible with community goals and at minimum expense.

A.2.a. The State of Oklahoma considers ACOG a subrecipient of the federal funds it receives as reimbursement under this CONTRACT.

A.2.b. CFDA Number: 20.205 (Metropolitan Transportation Planning and State and Non-Metropolitan Planning and Research).

A.3. Progress Reports

NORMAN shall provide ACOG progress reports regarding the planning work status of the FTA 5303 funds. Progress reports on the use of the 5303 funds shall be submitted quarterly and may be

combined with NORMAN's regular quarterly UPWP progress reports. The final progress report shall be submitted on or before July 15, 2023.

A.4. Inspection of Work

ACOG shall be accorded proper facilities for review and inspection of the work hereunder and shall at all reasonable times have access to the premises, to all reports, presentations, books, records, correspondence, instructions, receipts, vouchers, memoranda, and any other materials of every description which ACOG considers pertinent to the work hereunder. The PARTIES will fully inform each other in the event of any review and inspection of work specified hereunder by other than PARTIES. ACOG shall maintain the responsibility of review and concurrence in all techniques and methodology utilized.

A.5. Records

NORMAN shall maintain accounting records and other evidence pertaining to the costs incurred under this CONTRACT. This data will be made available for inspection by ACOG, at all reasonable times at the respective offices during the contract period and for three years after the date of the final payment of Federal funds to ACOG with respect to the study. Copies of such records shall be furnished at cost to ACOG.

The books, records, and documents of NORMAN, insofar as they relate to money received under this CONTRACT, shall be maintained for a period of three (3) full years from the date of the final payment and shall be subject to audit at any reasonable time and upon reasonable notice by ACOG, ODOT and/or FTA, the Oklahoma State Auditor and Inspector, or their duly appointed representatives.

A.6. Ownership of Data

The ownership of the data collected under this CONTRACT, together with reports, brochures, summaries, and all other materials of every description derived therefrom, shall be vested in both PARTIES, subject to the applicable Federal and State laws and regulations.

A.7. Information and Reports

Unless otherwise required by law, all information, reports, proposals, brochures, summaries, written conclusions, graphic presentations, and similar materials developed by NORMAN and/or its consultants and financed in whole or in part by ACOG, shall be submitted to ACOG for review upon its public release, presentation, dissemination, publication, or other distribution. The distribution of such information and reports, whether draft or final and including the UPWP, to any unit of the FTA shall be made through ACOG only.

A.8. Publication Provisions

NORMAN shall be free to copyright material developed under this CONTRACT with the provision that ACOG and FTA reserve a royalty-free, nonexclusive, and irrevocable License to reproduce, publish or otherwise use, and to authorize others to use, the work for Government purposes. All reports published pursuant to this CONTRACT shall contain a credit reference to the FTA; such as "prepared in cooperation with the U.S. Department of Transportation, Federal Transit Administration."

B. GRANT CONTRACT TERMS

B.1. Funding Amount

The financing set forth in this CONTRACT shall not exceed \$50,000 of which \$40,000 are FTA funds and shall be on the basis of direct and indirect actual auditable cost as stated in 23 CFR Chapter 1, §420.113 and the provisions of the "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards," 2 Code of Federal Regulations (CFR) 200 Subpart E.

B.2. Funding Period

The provisions of this CONTRACT shall become effective on the first day of July 2022, or on the day this Federal-aid project is authorized by FTA, whichever comes later. This CONTRACT shall be effective until all FTA funds provided under B.1. have been expended or June 30, 2023, whichever comes first.

B.3. Matching Funds

The funds provided by ACOG pursuant to this CONTRACT is eighty percent (80%) of total actual auditable costs. The remaining twenty percent (20%) of the funds are to be provided by NORMAN.

B.4. Funding Availability

ACOG presently has funds available, allocated through the FTA and administered by ODOT, which may be used to facilitate Metropolitan Transportation Planning. Contingent upon the continued availability of such funds, ACOG shall participate in the planning effort to be conducted within the TMA boundary as detailed in the UPWP.

C. PAYMENT TERMS AND CONDITIONSC.1. Limitation of Liability

The maximum liability of ACOG pursuant to this CONTRACT shall not exceed \$40,000.

C.2. Payment Methodology

NORMAN shall only be reimbursed for tasks as detailed Section A.1.b. and the FY 2023 UPWP. NORMAN shall submit invoices accompanied by bills of sale and documentation as further described in Sections C.3. Payments for services described in the UPWP and this CONTRACT for cooperative funding shall be disbursed by ACOG on the basis of monthly billings from NORMAN showing the total actual costs incurred in conformance with the UPWP.

C.3. Invoice Requirements

NORMAN shall invoice ACOG digitally with supporting documentation as required by ACOG. The documentation shall be submitted to:

ACOG
Attn: Hannah Nolen, Transportation Planning Services
4205 N. Lincoln Blvd.
Oklahoma City, OK 73105
Telephone: 405-234-2264
Email: hnolen@acogok.org

C.3.a. Each invoice shall be similar to the example provided by ACOG and shall clearly and accurately detail the following required information:

1. Invoice date and billing period
2. Contract number (FTA-PL-2023-02, assigned by ACOG to this CONTRACT)
3. NORMAN Federal Employer Identification Number
4. NORMAN remittance address
5. NORMAN contact (name, phone, and/or email address for the individual to contact with invoice questions)
6. Complete itemization of reimbursement requested, which shall include documentation of paid expenses and shall include each of the following:
 - a. Itemized bill of sale showing dates of sale/service
 - b. Itemized invoices for any costs for which reimbursement is requested
 - c. Total reimbursement amount requested

C.3.b. Each invoice shall be accompanied by a brief, narrative report describing the tasks that were completed during the billing period.

C.4. Invoice Timing and Limitations

An invoice from NORMAN to ACOG pursuant to this CONTRACT shall include only reimbursement requests for actual expenditures as described in Section A.1.b. and C.2. of this CONTRACT subject to the liability limits as described in Section C.1.

C.4.a. All invoices for reimbursement must be received by ACOG no later than July 15, 2023.

C.4.b. NORMAN's failure to provide all invoices to ACOG as required shall result in NORMAN being deemed ineligible for reimbursement of those invoices under this CONTRACT, and any and all financial and legal liabilities related to this CONTRACT shall be upon NORMAN and not the responsibility or liability of ACOG.

C.5. Payment of Invoice

ACOG shall, within 90 days of receipt of invoices for allowable costs relating to the tasks outlined in Section A.1.b., review and process invoices as well as requests reimbursement from ODOT for NORMAN's expenditures. Once ODOT has provided reimbursement for NORMAN's expenditures, ACOG shall issue payment to NORMAN.

C.6. Unallowable Costs

Travel expenses are not eligible for reimbursement pursuant to this CONTRACT. NORMAN's invoice(s) shall be subject to reduction for amounts for travel expenses included in any invoice from NORMAN. Any such reductions shall be at the sole discretion of ACOG.

C.7. Disputes Related to Finances

In the event of disagreement between the PARTIES relative to the eligibility of NORMAN's financial participation in any work item or items contained in the UPWP, the details of such disagreement shall be forwarded to both the Executive Director of ACOG and the Administrator of NORMAN who jointly shall attempt to resolve the issue.

C.8. Audit

As part of this CONTRACT, NORMAN agrees to provide ACOG with a Single Audit performed in accordance with the "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards," 2 CFR 200 Subpart F to ensure compliance with federal and state laws, regulations, and provisions of the CONTRACT. The Single Audit will be performed by an independent auditor in accordance with generally accepted government auditing standards covering financial audits. If federal or state exceptions are found, the PARTIES will resolve the outstanding issues as provided under Section C.7.

D. TERMS AND CONDITIONS

D.1. Required Approvals

Neither PARTY is bound by this CONTRACT until it is approved by the appropriate government entity legal signatory in accordance with applicable laws and regulations.

D.2. Completeness

This CONTRACT, together with the following attachments, represents the entire and integrated agreement between the PARTIES relating to the subject matter contained herein, and supersedes any and all prior understandings, representations, negotiations, and discussions between the PARTIES relating hereto, whether written or oral.

D.3. Modification or Amendment

This CONTRACT shall not be modified, amended, altered, or supplemented except by an instrument in writing signed on behalf of the PARTIES hereto and executed with the same formalities observed in the execution of this CONTRACT.

D.4. Communications and Contacts

All demands, requests, or other communications which may be or are required to be given, served, or sent by either PARTY to the other pursuant to the CONTRACT shall be in writing and shall be deemed to have been properly given or sent:

If intended for ACOG, by electronic transmission to hnoles@acogok.org, or by mail, addressed to ACOG at:

Association of Central Oklahoma Governments
Attn: Hannah Nolen, Transportation Planning Services
4205 N. Lincoln Blvd.
Oklahoma City, OK 73105

If intended for NORMAN, by electronic transmission to taylor.johnson@normanok.gov or by mail addressed to NORMAN at:

City of Norman
Attn: Taylor Johnson – Transit and Parking Program Manager
1310 D Vinci Street
Norman, OK 73069

D.5. Termination

This CONTRACT was entered into by the PARTIES because of their mutual accord that the comprehensive, continuing, and cooperative transportation planning process provided herein was necessary. Either PARTY may terminate its interest and its obligation under this CONTRACT by giving thirty (30) days notice in writing to the other PARTY, it being understood that such termination may be adverse to the interests of the other PARTY. In the event of such termination, NORMAN shall deliver at cost to ACOG all items mentioned in Sections A.3., A.4., and A.7. of this CONTRACT within thirty (30) calendar days following the effective termination date.

D.6. Use of Consultants

Under the terms of pursuant to this CONTRACT, NORMAN may engage qualified consultants to perform certain duties on its behalf. All contracts with other parties for services within the scope of this CONTRACT shall be justified, in writing, by NORMAN and retained with project records as outlined in Section A.5.

D.7. Compliance

NORMAN and ACOG agree to adhere to the terms and conditions of this CONTRACT, to include all attachments hereto.

D.8. Covenants Against Contingent Fees

NORMAN warrants that it has not employed or retained any company or person specifically to solicit or secure this CONTRACT, and that it has not paid or agreed to pay any fee, commission, percentage, brokerage fee, gifts, or any other consideration, contingent upon or resulting from the award or making of this CONTRACT. For breach or violation of this warranty ACOG shall have the right to annul this CONTRACT without liability, or at its discretion, to deduct from the CONTRACT

price or consideration, or otherwise recover, the full amount of such fee, commission, percentage brokerage fee, gift, or contingent fee.

D.9. Governing Laws and Regulations

NORMAN and its subcontractors shall comply with all Federal, State, and local laws, statutes, ordinances, rules and regulations, and the orders and decrees of any court or administrative bodies or tribunals in any nature affecting the performance of this CONTRACT including worker compensation laws, minimum and maximum salary and wage statutes and regulations. When required, NORMAN shall furnish ACOG with satisfactory proof of its compliance therewith.

This CONTRACT shall be governed and construed in accordance with the laws of the State of Oklahoma.

D.10. Binding Effect

This CONTRACT shall be binding upon and inure to the benefit of the PARTIES and shall be binding upon their successors, to the extent allowed by law.

D.11. Force Majeure

The obligations of the PARTIES to this CONTRACT are subject to prevention by causes beyond the PARTIES' control including, but not limited to, acts of God, riots, wars, epidemics, or any other similar cause.

D.12. Liability

NORMAN, ACOG, and FTA mutually recognize that each PARTY is a governmental entity subject to the provisions of their respective Governmental Tort Claims Act (51 O.S. § 151 et seq.). The PARTIES hereby mutually agree that each is and may be held severally liable for any and all claims, demands, and suits in law or equity, of any nature whatsoever, paying for damages or otherwise, arising from any negligent act or omission of any of their respective employees, agents or officers which may occur during the prosecution or performance of this Agreement to the extent provided in the Governmental Tort Claims Act, without waiving any of the PARTY's defenses, exemption or sovereignty. Each PARTY agrees to severally bear all costs of investigation and defense of claims arising under the Governmental Tort Claims Act and any judgments which may be rendered in such cause to the limits provided by law. Nothing in this section shall be interpreted or construed to waive any legal defense which may be available to a PARTY or any exemption, limitation or exception which may be provided by the Governmental Tort Claims Act.

D.13. Severability

If any provision, clause or paragraph of this contract or any document incorporated by reference shall be determined invalid by a court of competent jurisdiction, such determination shall not affect the other provisions, clauses, or paragraphs of this contract which is not affected by the determination. The provisions, clauses, or paragraphs and any documents incorporated by reference are declared severable and the invalidation of any such provision, clause, paragraph, or document incorporated by reference shall not affect the remaining provisions, clauses, paragraphs, and documents incorporated by reference which shall continue to be binding and of full legal efficacy.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the last date written below.

ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS

By: _____
Mark W. Sweeney, AICP, Executive Director

Date: _____

REVIEWED for form and legality.

By: _____
Pete White, ACOG General Counsel

Date: _____

THE CITY OF NORMAN

By: _____
Mayor

Date: _____

ATTEST:

By: _____
Secretary

APPROVED as to form and legality this _____ day of _____, 2023.

By: _____
City Attorney

EXHIBIT A

Federal-Aid Eligibility Certification

The undersigned hereby certifies to the best of their knowledge and belief:

1. That they are the fully authorized agent of the Prospective Participant in this project which involves, federal funding and has full knowledge and authority to make this certification
2. That, neither the Prospective Participant nor any person associated therewith in the capacity of director, officer, manager, auditor, or accountant, nor any person in a position involving the administration of federal funds:
 - a. Is currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency; and
 - b. Has been suspended, debarred, voluntarily excluded, or determined ineligible by any federal agency within the past three (3) years; and
 - c. Has a proposed debarment pending; and
 - d. Has been indicted, convicted, or had a civil judgement rendered against any of the aforementioned by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past three years, except:

If none, so state by entering the word "none": _____

Chairperson

Date

EXHIBIT B
(page 1 of 2)

Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion –Lower Tier Covered Transactions

This certification applies to subcontractors, material suppliers, vendors, and other lower tier participants.

- Appendix B of 49 CFR Part 29 -

Appendix B --

Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospect lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- 7.

EXHIBIT B
(page 2 of 2)

Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion –Lower Tier Covered Transactions

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
10. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

EXHIBIT C
(page 1 of 2)

Nondiscrimination of Employees

During the performance of this contract, NORMAN, for itself, its assignees, and successors in interest hereby covenants and agrees as follows:

1. NORMAN and its subcontractors shall provide equal employment opportunities for all qualified persons within the limitations hereinafter set forth, and shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, or handicap.
2. That any subcontract entered into by NORMAN for performance of any portion of the work covered under this Contract shall incorporate all of the provisions of this Special Provision, "Nondiscrimination of Employees," and the same shall be appended to said subcontract and incorporated therein by reference.
3. NORMAN shall refrain from "discriminatory practices," as hereinafter defined. It is a discriminatory practice for NORMAN to:
 - a. Fail or refuse to hire, to discharge or otherwise to discriminate against an individual with respect to compensation or the terms, conditions, privileges or responsibilities or employment, because of race, color, religion, sex, national origin, age, or handicap
 - b. Limit, segregate, or classify an employee in a way which would deprive or tend to deprive an individual of employment opportunities or otherwise adversely affect the status of an employee, because of race, color, religion, sex, national origin, age, or handicap
 - c. Discriminate against an individual because of race, color, religion, sex, national origin, age or handicap, in admission to, or employment in, any program established to provide apprenticeship, on-the-job training or retraining
 - d. Publish or cause to be printed or published any notice or advertisement relating to employment by NORMAN indicating a preference, limitation, specification, or discrimination, based on race, color, religion, sex, national origin, age or handicap, except where such preference, limitation, specification or discrimination based on religion, sex or national origin is a bona fide occupational qualification for employment
 - e. Retaliate or discriminate against a person because said person has opposed a discriminatory practice, or because said person has made a charge, filed a complaint, testified, assisted, or participated in an investigation, proceeding, or hearing under Chapter 21, Title 25, Oklahoma Statutes, 1991.
 - f. Aid, abet, incite, or coerce a person to engage in a discriminatory practice
 - g. Willfully interfere with the performance of a duty or the exercise of a power by the Oklahoma Human Rights Commission or one of its members or representatives

EXHIBIT C
(page 2 of 2)

Nondiscrimination of Employees

- h. Willfully obstruct or prevent a person from complying with the provisions of Chapter 21, Title 25, Oklahoma Statutes, 1991
 - i. Attempt to commit, directly or indirectly, a discriminatory practice, as defined herein and as defined in Chapter 21, Title 25, Oklahoma Statutes, 1991
- 4. NORMAN further agrees to refrain from discrimination by reason of race, color, religion, sex, national origin, age, or handicap, against any persons, firm or corporation furnishing independent contract labor or materials to NORMAN in the performance of this Contract.
- 5. Sanctions for Noncompliance - In the event NORMAN violates or refuses to abide by any of the provisions herein set forth, ACOG reserves the right and option to:
 - a. Withhold payments to NORMAN until NORMAN furnishes satisfactory evidence of compliance and correction of all violations
 - b. Cancel, terminate, or suspend the Contract, in whole or in part, without further liability to ACOG other than payment for work performed up to the effective date of cancellation or termination of the contract.
 - c. Report all violations, which are not corrected by NORMAN within such time as is specified by ACOG in its notice of violation, to the Oklahoma Human Rights Commission for such further proceedings as said Commission deems reasonable and necessary.
- 6. Immediately upon notification of Contract award, NORMAN shall submit to ACOG's Internal Equal Employment Officer a list by number, percentage, and position, including the identifying minority group employees who will be actively engaged in the Contract performance.
- 7. NORMAN hereby agrees to be bound by and subject itself to the provisions of Title 29, Code of Federal Regulations, Parts 1601-1605, inclusive, insofar as the same have been adopted by the Oklahoma Human Rights Commission for governing procedural matters concerning the administrative operations, functions, duties, and responsibilities of said Commission.
- 8. NORMAN further agrees to be bound by and be subject to any and all laws, statutes, or regulations of administrative agencies of the State of Oklahoma, pertaining to employment practices in contracts being funded either in whole or in part with funds of the State of Oklahoma, and to the requirements of any and all laws, statutes or regulations of administrative agencies of the State of Oklahoma, and to the requirements of any and all laws, statutes or regulations of administrative agencies of the State of Oklahoma pertaining to equal employment opportunity and nondiscrimination requirements in such contracts and public projects being so funded.

EXHIBIT D
(page 1 of 2)

Oklahoma Department of Transportation Disadvantaged Business/Women's Business Enterprises
Policy Statement

It is the policy of the Oklahoma Department of Transportation to ensure that Disadvantaged Business/Women's Enterprises (DBE/WBE) as defined in 49 CFR Part 23 shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with federal funds under this CONTRACT. Consequently, the DBE/WBE (formerly MBE) requirements of 49 CFR Part 23 apply to this CONTRACT.

The Oklahoma Department of Transportation or its Consultants which are recipients of Federal-aid funds agree to ensure that disadvantaged business/women's enterprises as defined in 49 CFR Part 23 have the maximum opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with federal funds provided under this CONTRACT. In this regard, the Oklahoma Department of Transportation, ACOG, NORMAN, and Consultants shall take all necessary and reasonable steps in accordance with 40 CFR Part 23 to ensure that disadvantaged business/women's business enterprises have the maximum opportunity to compete for and perform contracts. The Oklahoma Department of Transportation, ACOG, NORMAN, and Consultants shall not discriminate on the basis of race, color, national origin, religion, or sex in the award and performance of Oklahoma Department of Transportation assisted contracts.

Failure to carry out the requirements set forth above shall constitute a breach of contract and, after the notification of the Oklahoma Department of Transportation, may result in termination of the contract by the recipient or other such remedy as the recipient deems appropriate.

EXHIBIT D
(page 2 of 2)

Oklahoma Department of Transportation Contracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

1. It is national policy to award a fair share of contracts to small and minority business firms. Accordingly, affirmative steps must be taken to assure that small and minority businesses are utilized when possible as sources of supplies, equipment, and services. Affirmative steps shall include the following:
 - a. Including qualified small and minority business on solicitation lists.
 - b. Assuring that small and minority businesses are solicited whenever they are potential sources.
 - c. When economically feasible, dividing total requirements into smaller tasks or quantities so as to permit maximum small and minority business participation.
 - d. Where the requirement permits, establishing delivery schedules which will encourage participation by small and minority business.
 - e. Using the services and assistance of the Small Business Administration, the Office of Minority Business Enterprise of the Department of Commerce and the Community Services Administration as required.
 - f. If any subcontracts are to be let, requiring the prime contractor to take the affirmative steps in (a) through (e) above.
2. Grantees shall take similar appropriate affirmative action in support of women's business enterprises.
3. Grantees are encouraged to procure goods and services from labor surplus areas.
4. Grantor agencies may impose additional regulations and requirements in the foregoing areas only to the extent specifically mandated by statute or presidential direction.

EXHIBIT E

Certification for Federal-Aid Contracts

The undersigned certifies, to the best of their knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit standard Form-LLL, "Disclosure Forms to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all subawards in excess of \$100,000, at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Chairperson

Date

4205 N. Lincoln Blvd. | OKC

ACOG MPO UNIFIED PLANNING WORK PROGRAM

FY 2023

acog



Association of Central Oklahoma Governments
4205 N. Lincoln Boulevard
Oklahoma City, OK 73105
Telephone: (405) 234-ACOG (2264)
www.acogok.org

Reviewed by the ACOG MPO Technical Committee - June 16, 2022

Approved by the ACOG MPO Policy Committee

This report is the product of a project (study) financed in part by the Federal Transit Administration and the Federal Highway Administration of the U.S. Department of Transportation.

The contents of this report reflect the views of the Association of Central Oklahoma Governments Metropolitan Planning Organization (ACOG MPO). ACOG is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect official views or policy of the U.S. Department of Transportation. This report does not constitute a standard, specification, or regulation.

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PART 1: INTRODUCTION

The Unified Planning Work Program (UPWP) is a description of the proposed multimodal transportation planning activities to be conducted in the Association of Central Oklahoma Governments Metropolitan Planning Organization (ACOG MPO) area during FY 2023 (July 1, 2022, to June 30, 2023). This program is administered by ACOG, in accordance with a *Memorandum of Understanding* between ACOG, the Oklahoma Department of Transportation (ODOT), the Central Oklahoma Transportation and Parking Authority (COTPA), and the City of Norman (Norman-Transit). ACOG serves as the MPO for the Oklahoma City Transportation Management Area, providing a multi-government, multi-agency body for carrying out a continuing, coordinated, comprehensive program of multimodal transportation system planning.

The Federal Highway Administration (FHWA) and Federal Transit Administration's (FTA) Offices of Planning have jointly issued Planning Emphasis Areas (PEAs) to assist MPOs in identifying and developing UPWP tasks.

- **Tackling the Climate Crisis – Transition to a Clean Energy, Resilient Future**—Ensure transportation plans and infrastructure investments help achieve the national greenhouse gas reduction goals and increase resilience to extreme weather events and other disasters resulting from the increasing effects of climate change
- **Equity and Justice**—Advance racial equity and support for underserved and disadvantaged communities
- **Complete Streets**—Review current policies, rules, and procedures to determine their impact on safety for all road users
- **Public Involvement**—Increase meaningful public involvement in transportation planning by integrating Virtual Public Involvement (VPI) tools into the overall public involvement approach while ensuring continued public participation by individuals without access to computers and mobile devices
- **Strategic Highway Network (STRAHNET)/US Department of Defense (DOD) Coordination**—Coordinate with representatives from DOD in the transportation planning and project programming process on infrastructure and connectivity needs for STRAHNET routes and other public roads that connect to DOD facilities
- **Federal Land Management Agency (FLMA) Coordination**—Coordinate with FLMA in the transportation planning and project programming process on infrastructure and connectivity needs related to access routes and other public roads and transportation services that connect to Federal lands
- **Planning and Environmental Linkages (PEL)**—Implement PEL as part of the transportation planning and environmental review processes
- **Data in Transportation Planning**—Incorporate data sharing and consideration into the transportation planning process, because data assets have value across multiple programs

The UPWP is prepared annually and serves as a basis for requesting federal planning funds from the U.S. Department of Transportation, as well as a management tool for scheduling, budgeting, and monitoring the planning activities of the participating entities. This document was developed with input from numerous agencies, including ODOT, FHWA, FTA, COTPA, the City of Norman, the Oklahoma City Traffic Management Division, and other cities included in the TMA

PART 2: ACOG MPO ORGANIZATION

COMMITTEE STRUCTURE

Multimodal transportation planning and implementation require a unified policy direction for all modes of travel. This direction is provided by a committee structure, which was developed jointly by the Oklahoma Department of Transportation and local governments within the ACOG MPO. The structure includes the ACOG MPO Policy Committee, ACOG MPO Technical Committee, and Stakeholder Advisory Group (SAG). The ACOG MPO organizational structure, which includes additional committees and subgroups, is shown in [Figure 1](#).

ACOG MPO Policy Committee

The ACOG MPO Policy Committee has 46 members and is the single policy group for regional transportation decision making in the ACOG MPO area. The Policy Committee voting membership is composed of locally elected officials, state transportation department managers and commissioners, and designees from other local agencies, representing various transportation modes. Each member local government has one vote. Federal aviation, transit, and highway officials are designated as non-voting Policy Committee members. The primary functions of the Policy Committee are to provide guidance for multimodal transportation planning and to assure coordination among transportation modes, local government entities, and planning efforts. The current membership of the Policy Committee is shown in [Table 1](#).

The Chairman of the Policy Committee is elected from the membership every year for a one-year term. Individual local governing bodies select their representatives to the Policy Committee. Staff personnel of ACOG have been designated by the Policy Committee to provide administrative and clerical support to the Committee. The Policy Committee meets at 1:20 p.m., usually on the last Thursday of each month in the Board Room of the Association of Central Oklahoma Governments.

ACOG MPO Technical Committee

Technical review and guidance for the ACOG MPO planning programs are provided by the Technical Committee. This committee is generally composed of city planners, city engineers and traffic managers, and also includes representatives of various modes, environmental agencies, the Oklahoma Turnpike Authority, ODOT, and the federal transportation agencies.

The Technical Committee makes recommendations to the Policy Committee concerning adoption and approval of all transportation plans and programs, such as the Unified Planning Work Program (UPWP), the Metropolitan Transportation Plan (MTP), and the Transportation Improvement Program (TIP). The Technical Committee is governed by bylaws approved by the Policy Committee and typically meets at 10 a.m. on the second Thursday of each month to review the progress of the tasks outlined in the UPWP. The Technical Committee also monitors the performance of the regional transportation system and recommends policy changes to the Policy Committee to improve system performance.

Stakeholder Advisory Group (SAG)

With the update of the Public Participation Plan (PPP) in 2020, the previous Citizens Advisory Committee (CAC) was replaced with a Stakeholders Advisory Group (SAG). ACOG extended SAG membership to representatives of all transportation modes, minority and elderly populations, persons with disabilities, businesses, local governments, environmental/public interest groups, neighborhoods, and private citizens. This committee provides a tool to ensure that the public is kept aware of planning developments, that the transportation planning process is responsive to public needs, and that advocates of various modes are included and heard.

**Figure 1:
ACOG MPO Organization**

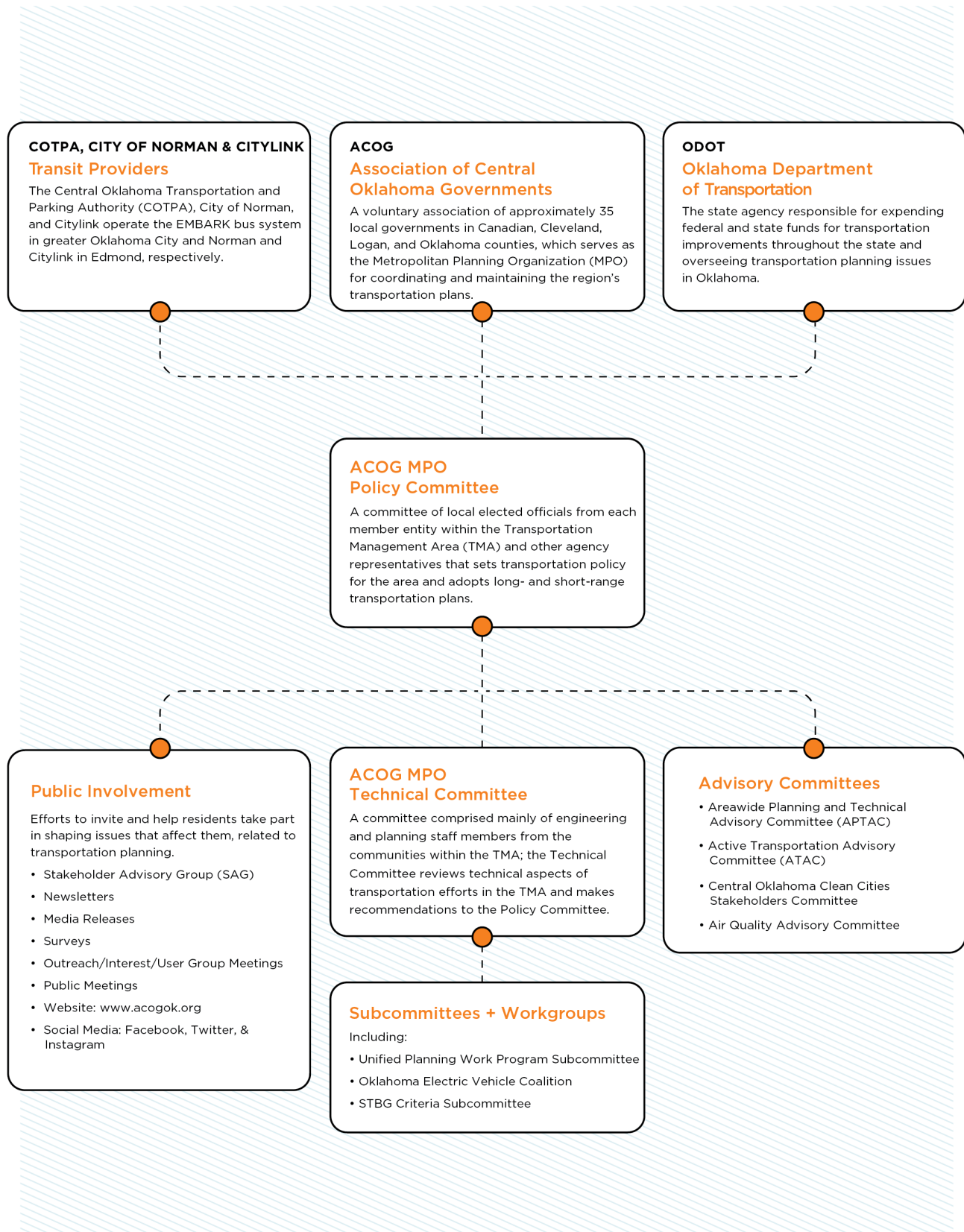


Table 1:
ACOG MPO Policy Committee
as of May 26, 2022

LUTHER

ACOG MPO POLICY COMMITTEE

LOCAL GOVERNMENT MEMBERS		
CITY/ORGANIZATION	MEMBERS	ALTERNATES
BETHANY	Hon. Nikki Lloyd Mayor	Hon. Chris Powell Vice-Mayor Hon. Kathy Larsen Councilmember
BLANCHARD	Hon. Chuck Kemper Councilmember	Hon. Eddie Odle Mayor Hon. Joe Davis Councilmember
CEDAR VALLEY	Hon. Tom Trello Vice-Mayor	Hon. Jerry Cole Trustee
CHOCTAW	Hon. Chad Williams Councilmember	Hon. Jeannie Abts Councilmember
COLE	Hon. W. Chester Anderson Mayor	Hon. Robert Green Trustee Hon. Ronnie Lynn McCaskill Trustee
DEL CITY	Hon. Floyd Eason Mayor	Hon. Pam Finch Vice Mayor Hon. Michael Dean Councilmember
EDMOND	Hon. Josh Moore Councilmember	Hon. Darrell Davis Mayor
FOREST PARK	No Designee	Vacant
GOLDSBY	Hon. Glenn Berglan Mayor	Hon. Russ McReynolds Vice Mayor
GUTHRIE	Hon. Steven J. Gentling Mayor	Hon. Jeff Taylor Councilmember
HARRAH	Hon. Tim Rudek Councilmember	Hon. Chris Lally Councilmember
JONES CITY	Hon. Ray Poland Mayor	Hon. Missy Wilkinson Vice-Mayor
LEXINGTON	Hon. Mike Donovan Councilmember	Hon. Max Punneo Vice-Mayor

ACOG MPO POLICY COMMITTEE (Cont.)			TUTTLE
LOCAL GOVERNMENT MEMBERS (Cont.)			
CITY/ORGANIZATION	MEMBERS	ALTERNATES	
MIDWEST CITY	Hon. Matt Dukes Mayor	Hon. Pat Byrne Councilmember	
		Hon. Rick Favors Councilmember	
MOORE	Hon. Mark Hamm Councilmember	Hon. Glenn Lewis Mayor	
		Any Moore Councilmember	
MUSTANG	Hon. Brian Grider Mayor	Hon. Michael Ray Councilmember	
NEWCASTLE	Hon. Mike Fullerton Vice Mayor	Hon. Gene Reid Councilmember	
NICHOLS HILLS	Hon. Peter Hoffman Mayor	Vacant	
NICOMA PARK	Hon. Mark Cochell Mayor	Hon. Mike Czerczyk Vice Mayor	
NOBLE	Hon. Phil Freeman Mayor	Hon. Ezra Roesler Vice-Mayor	
		Hon. Gary Hicks Councilmember	
NORMAN	Hon. Breea Clark Mayor	Hon. Stephen T. Holman Councilmember	
OKLAHOMA CITY	Hon. Todd Stone Councilmember	Any Oklahoma City Councilmember	
PIEDMONT	No Designee	Hon. Melissa Ashford Councilmember	
		Hon. Austin Redus Councilmember	
SLAUGHTERVILLE	Hon. John Koehler Trustee	Eugene Dicksion Mayor	
SPENCER	Hon. Frank Calvin Mayor	Charmin Williams Vice Mayor	

ACOG MPO POLICY COMMITTEE (Cont.)		
LOCAL GOVERNMENT MEMBERS (Cont.)		
CITY/ORGANIZATION	MEMBERS	ALTERNATES
THE VILLAGE	Sonny Wilkinson Hon. Mayor	Hon. Adam Graham Vice-Mayor
WARR ACRES	Hon. Jim Mickley Mayor	Hon. Roger Godwin Councilmember
		Hon. John Knipp Councilmember
YUKON	Hon. Shelli Selby Mayor	Vacant
CANADIAN COUNTY	Hon. Marc Hader Commissioner	Hon. Jack Stewart Commissioner
		Hon. David Anderson Commissioner
CLEVELAND COUNTY	Hon. Rod Cleveland Commissioner	Hon. Darry Stacy Commissioner
		Hon. Harold Haralson Commissioner
LOGAN COUNTY	Hon. Kody Ellis Commissioner	Hon. Marvin Goodman Commissioner
		Hon. Monty Piearcy Commissioner
MCCLAIN COUNTY	Hon. Wilson Lyles Commissioner	Hon. Terry Daniel Commissioner
OKLAHOMA COUNTY	Hon. Carrie Blumert Commissioner	Hon. Brian Maughan Commissioner
		Hon. Kevin Calvey Commissioner

Agency Members and Non-Voting Members on next page.

ACOG MPO POLICY COMMITTEE (Cont.)**AGENCY MEMBERS**

CITY/ORGANIZATION	MEMBERS	ALTERNATES
CENTRAL OKLAHOMA TRANSPORTATION AND PARKING AUTHORITY (COTPA)	Jason Ferbrache Administrator	Marty Dickens Fed Assets & Grants Coordinator
CITY OF NORMAN, OKLAHOMA (Transit)	Taylor Johnson Transit & Parking Program Mgr.	Jason Huff Transit Planner & Grants Specialist
OKLAHOMA CITY AIRPORT TRUST	Randon Rieger, P.E. Civil Engineer III	John Storms Civil Engineer IV
OKLAHOMA DEPT. OF TRANSPORTATION (ODOT)- Strategic Asset & Performance Management (SAPM)	Matthew Swift Division Engineer SAPM	Laura Chaney Branch Manager Planning & Performance
OKLAHOMA DEPT. OF TRANSPORTATION (ODOT) - Office of Mobility	No Designee	Vacant
OKLAHOMA TRANSPORTATION COMMISSION (OTC) - DIVISION 3 - MCCLAIN & CLEVELAND COUNTIES IN ACOG MPO AREA	T. W. Shannon Transportation Commissioner	Rick Johnson ODOT Director of Capital Programs
OKLAHOMA TRANSPORTATION COMMISSION (OTC) - DIVISION 4 - CANADIAN, LOGAN, & OKLAHOMA COUNTIES IN ACOG MPO AREA	Don Freymiller Transportation Commissioner	Angel Gonzalez ODOT Asst. Division Engineer, SAPM
OKLAHOMA TRANSPORTATION COMMISSION (OTC) - DIVISION 7 - GRADY COUNTY IN ACOG MPO AREA	Stephen J. LaForge Transportation Commissioner	Jeremy Planteen ODOT Asst. Division Manager, SAPM

NON-VOTING MEMBERS

CITY/ORGANIZATION	MEMBERS	ALTERNATES
FEDERAL AVIATION ADMINISTRATION (FAA)	Glenn Boles Manager AR/OK Airports District Office	Vacant
FEDERAL HIGHWAY ADMINISTRATION (FHWA)	Basharat Siddiqi Oklahoma Division Administrator	Carl Selby Program Support Team Leader Isaac Akem Community Planner
FEDERAL TRANSIT ADMINISTRATION (FTA)	No Designee	Vacant

SPONSOR AGENCIES

The ACOG MPO is sponsored by the State of Oklahoma (ODOT), the local transit operators (COTPA and the City of Norman) and the Metropolitan Planning Organization (ACOG). The ACOG MPO planning process is staffed with personnel from each of these sponsor agencies and with additional transportation personnel from the City of Oklahoma City and several suburban cities who work under contract with the Association of Central Oklahoma Governments.

Association of Central Oklahoma Governments (ACOG)

The Association of Central Oklahoma Governments (ACOG) is a voluntary association of city, town, and county governments within the four-county (Oklahoma County, Cleveland County, Logan County, and Canadian County) region known as Central Oklahoma. Established in 1966, ACOG's purpose is to aid local governments in planning for common needs, cooperating for mutual benefit, and coordinating for sound regional development. This regional cooperation serves to strengthen both the individual and collective capabilities of local governments.

ACOG is the designated Metropolitan Planning Organization (MPO), conducting the transportation planning process in compliance with the provisions of the Federal Highway and Federal Transit Acts of 1962, as amended by the Infrastructure Investment and Jobs Act (IIJA), signed into law November 15, 2021. Initially designated as a Metropolitan Planning Organization (MPO) in October 1973, ACOG has worked cooperatively with ODOT and other partners in Central Oklahoma to develop and maintain a regional transportation plan for the ACOG MPO area.

The Board of Directors serves as the governing body of the Association (Sec. 1. (e) (b), ACOG Agreement). The Board has sole authority to initiate and review all activities, grants, and contracts, and to adopt or approve any study or plan pertaining to the four-county region. This authority is exercised by a quorum of the Board voting according to the authorized weighted vote of each member government (Sec. IV, ACOG Agreement). The business of the Association is transacted according to the provisions of the "Agreement Creating the Association," effective March 31, 1983, as amended.

The ACOG Board of Directors reviews and may elect to endorse actions of the ACOG MPO Policy Committee. It is understood that items relating to the transportation planning process are covered by an annual agreement between ODOT and ACOG.

Oklahoma Department of Transportation (ODOT)

The Oklahoma Department of Transportation was established on September 1, 1976, following the State Legislature's approval of reorganization legislation.¹ The reorganization combined, in their entirety, the Oklahoma Highway Department, the Oklahoma Aeronautics Commission, and the Oklahoma Highway Safety Coordination Committee. Subsequently, in 2002, the Aeronautics Commission separated from ODOT and was classified as a separate agency. The Rail and Transit staff of the former Department of Economic and Community Affairs and the powers of the Railroad Maintenance Authority were also transferred to the Oklahoma Department of Transportation. In the early 1990s, the duties of the Waterways Branch of the Department of Commerce were also brought under the jurisdiction of ODOT.

According to Title 69 O.S. 1981, Sec. 4002, the Department of Transportation has the following responsibilities:

¹ "An Overview of the State's Public Transportation Mandate and Public Transportation Operations in Oklahoma." October 24, 1978. ODOT Planning Division.

1. To coordinate and develop for the State of Oklahoma a comprehensive transportation plan to meet present and future needs for adequate, safe and efficient transportation facilities at reasonable cost to the people.
2. To coordinate the development and operation of such transportation facilities in the state including, but not limited to, highways, public transportation, railroad, marine and waterways, and aeronautics.
3. To develop, periodically revise and maintain a comprehensive state master plan for transportation facilities.
4. To develop the STIP and approve the metropolitan TIPs as the Governor's designee.
5. To develop measurable objectives and goals designed to carry out the master plan for transportation and report progress in achievement of objectives and goals to the Governor and Legislature as part of the annual budget submission.
6. To make such studies and analyses of transportation problems as may be requested by the Governor or Legislature relative to any aspect of transportation in the state.
7. To exercise and perform such functions, powers and duties as may be, from time to time, conferred or imposed by law, including all the functions, powers and duties assigned and transferred to the Department of Transportation by this act.
8. To apply for, accept and receive and be the administrator for and on behalf of the state agencies, boards, and commissions of all federal or other monies now or hereafter available for purposes of transportation or which would further the intent and specific purposes of this act.
9. To cooperate with local governments in the planning and development of transportation-related activities and encourage state and federally funded plans and programs at the local level consistent with the goals and objectives of the state master plan for transportation.

ODOT has developed various techniques to generate public interest and to promote public participation in the decision-making process related to proposed transportation improvements undertaken with federal assistance.

The Department completes a field review for all projects in the 8-Year Construction Work Plan. The review consists of researching projects for location, design, and social, environmental, and economic impacts. Part of the social, environmental, and economic analysis during the review is a consideration of the public involvement needs for a specific project.

During the individual project development process, ODOT staff performs more detailed planning and engineering studies related to location, design, and analysis of social, environmental, and economic impacts. During this phase, one or more of the following public involvement tools may be employed: public meetings, distribution of flyers in the study area, press releases, meetings with locally elected officials, and coordination with local, state, and federal resource agencies.

The ACOG MPO public involvement process is coordinated with the ODOT process, and they are intended to be used as vehicles to promote maximum public participation early enough in the planning process to influence technical studies and subsequent final decisions. This ensures that decisions, as they are made, will be in the overall public interest and that the average citizen will have an adequate opportunity to have input during the decision-making process.

Local Transit Operators

Central Oklahoma Transportation and Parking Authority (COTPA)

The Central Oklahoma Transportation and Parking Authority was created under a Trust Indenture, dated February 1, 1966. The Trust has the authority "to plan, establish, develop, acquire, construct, purchase, install, repair, enlarge, improve, maintain and equip transit systems and facilities and public parking systems and facilities either within or outside the territorial boundaries of the City of Oklahoma City." This Trust Indenture establishes that COTPA has the authority to provide regional transit and parking services. COTPA is governed by a Board of eight Trustees, including the Oklahoma City Mayor, the City Manager of Oklahoma City, the Oklahoma City Finance Director and five additional trustees who are appointed by the Oklahoma City Council.

As of November 1, 1989, the City of Oklahoma City reorganized the city's transit system, creating the Department of Transit Services as the planning/administration arm of COTPA. The operations and maintenance functions of the transit system have remained the responsibility of the Authority.

Each year COTPA develops a Program of Projects (POP) reflecting anticipated capital, planning, and operating needs for the upcoming fiscal year along with an estimated budget. COTPA submits projects to the MPO for inclusion in the transit portion of the Transportation Improvement Program (TIP) and carries out the transit-related planning activities contained in the UPWP. In recent years, COTPA has been authorized, through the TIP, to use a portion of the region's Congestion Mitigation/Air Quality (CMAQ) funds for transit investments that demonstrate a positive impact on air quality. COTPA utilized the public notice/public involvement opportunities related to the TIP, performed by the MPO, to ensure opportunity for public input on the POP.

Norman-Transit

Cleveland Area Rapid Transit (CART) – previously administered under the umbrella of COTPA – was recognized as a small urbanized area transit entity as a result of the 2000 Census and became a direct recipient of FTA funds beginning in FFY 2003. Until August 2019, CART, operated by the University of Oklahoma, provide transit service for both on-campus and off-campus routes within the City of Norman. In FY 2019, the University of Oklahoma began transitioning operations of the off-campus public transit service to the City of Norman.

In July 2019, CART relinquished the use of FTA Section 5307 direct recipient funds designated to the Norman Urbanized Area and began operating on-campus bus service for the University of Oklahoma only, and the City of Norman began operation of the service for off-campus bus routes and paratransit services. The City of Norman, in place of CART, cooperatively works with ACOG, ODOT, and COTPA on the planning efforts outlined in the annual Unified Planning Work Program (UPWP), which includes development and implementation of the ACOG MPO Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP).

Citylink

Citylink runs four local routes serving the University of Central Oklahoma (UCO) campus and a large portion of the City of Edmond, as well as an express route to and from Oklahoma City.

AFFILIATED AGENCIES/ENTITIES

ACOG also works with the Air Quality Division of the Oklahoma Department of Environmental Quality (ODEQ) on preserving the Oklahoma City metropolitan area's air quality attainment

status through clean air initiatives including Ozone Alert Day outreach and the Ozone Advance program.

The ODEQ Air Quality Division was established in 1993 to implement the federal and state air quality mandates regarding emission inventory, planning, permitting, monitoring, compliance, and enforcement activities, as required under the 1990 Clean Air Act Amendments. The ACOG MPO area is currently in attainment status under the 1990 Clean Air Act Amendments, and under the terms of this Act, the ODEQ Air Quality Division is the designated agency responsible for preparing and monitoring the State Implementation Plan for the Oklahoma City metropolitan area.

ACOG MPO TRANSPORTATION MANAGEMENT AREA

The ACOG MPO Transportation Management Area encompasses all of Oklahoma and Cleveland Counties, and parts of Canadian, Grady, Logan, and McClain Counties. The ACOG MPO Policy Committee approved the current study area geography in February 2002.

[Figure 2](#) reflects the ACOG MPO area in relation to the four-county ACOG region. [Figure 3](#) reflects the urbanized areas within ACOG MPO.

Figure 2:
ACOG MPO Area in Relation to the Four-County ACOG Region

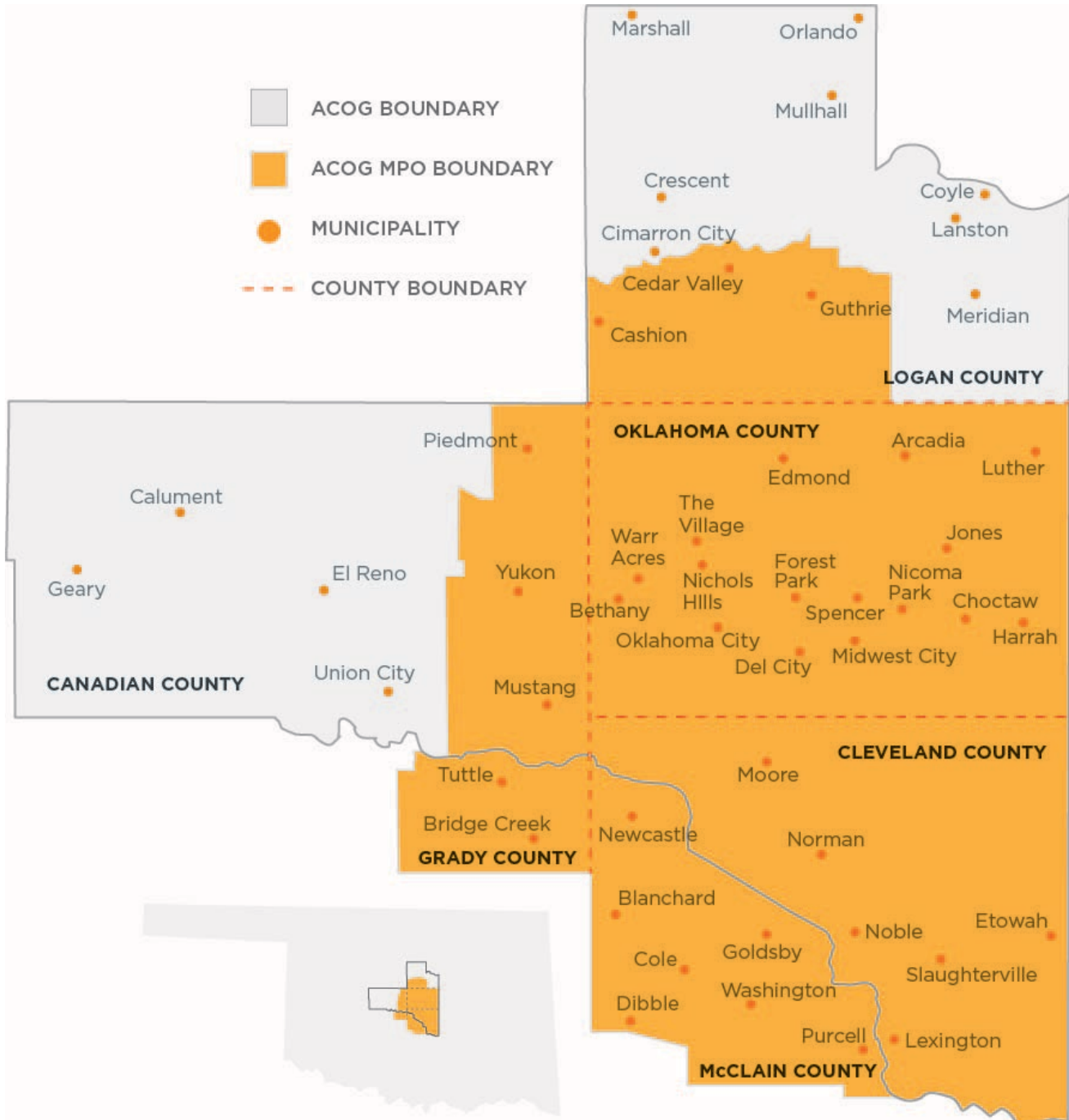
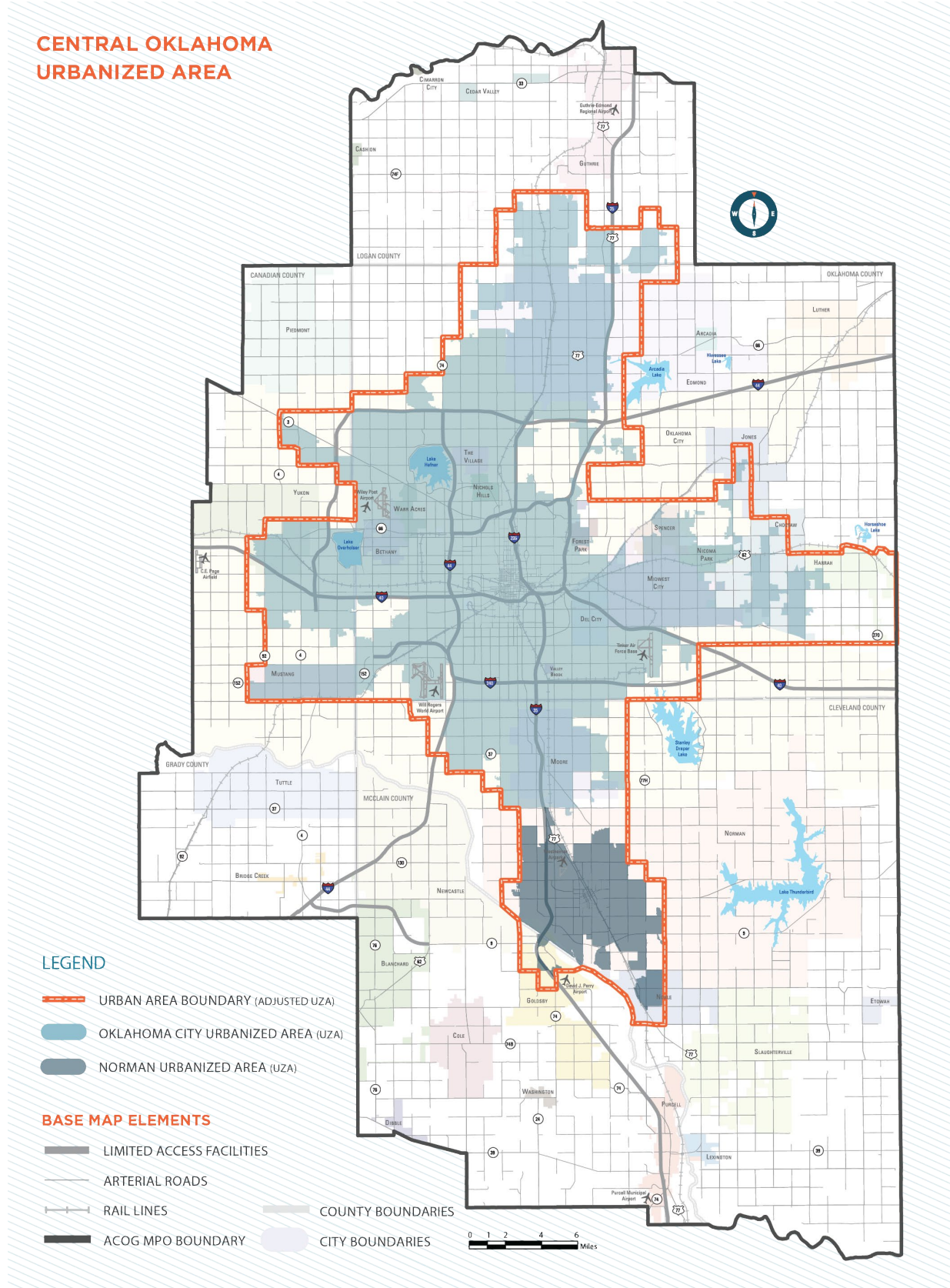


Figure 3:
ACOG MPO Transportation Management Area and Urbanized Areas



PART 3: FY 2023 UNIFIED PLANNING WORK PROGRAM PRIORITIES

The Unified Planning Work Program reflects and provides direction for implementing the financially constrained, public-influenced, intermodal ACOG MPO Plan, entitled *Encompass 2045*. The Metropolitan Transportation Plan, last adopted in 2021, has provided the framework for other modal plans including:

- East Edmond 2050 Plan, 2022
- OKC Moves Bus Plan, 2021
- Go Norman Transit Plan, 2021
- RTA of Central Oklahoma Transit System Plan, 2021
- Downtown Edmond Parking Plan, 2020
- adaptOKC, 2020
- Old Town Moore Revitalization Plan and Parking Analysis, 2019
- The Edmond Plan, 2018
- Eastern Oklahoma County Partnership Regional Comprehensive Plan, 2018
- bikewalkOKC, 2018
- planOKC, 2015 (amended 2020)
- Edmond Downtown Master Plan, 2014
- Norman Comprehensive Transportation Plan, 2014
- Central Oklahoma Commuter Corridors Study, 2014
- Oklahoma City Parks Master Plan, 2013
- Edmond Bicycle Master Plan, 2012
- Regional Intermodal Transportation Hub Study, 2011
- Greater Downtown Oklahoma City Circulator Alternatives Analysis, 2010
- Oklahoma City Project 180, 2010
- Midwest City Trails Master Plan and Implementation Study, 2010
- Oklahoma City Walkability Study, 2009
- Oklahoma City Downtown Streetscape Master Plan, 2009
- Master Trails Plan Update (City of Moore), 2008
- Oklahoma City Bicycle Transportation Strategic Action Plan 2008-2015, 2008
- Coordinated Public Transit-Human Services Plan, 2008
- Core to Shore Plan (Oklahoma City), 2007
- Fixed Guideway Study (COTPA), 2006
- Edmond Transportation Plan, 2006
- Oklahoma River Water Transport Mobility Program (Oklahoma City), 2005
- Norman Transportation Needs Assessment Study, 2003
- COTPA Long-Range Transit Plan, 2001

Thus, street and highway, bus, bicycle and pedestrian ways, and airport access improvements are all considered in the intermodal regional transportation plan that seeks the efficient movement of people and goods.

This Unified Planning Work Program (UPWP) presents the scope and direction of all transportation planning activities in the region and specifies which work program tasks will be accomplished during FY 2023 (July 1, 2022 to June 30, 2023). This part of the UPWP describes priorities related to various intermodal planning efforts in the ACOG MPO Transportation Management Area. Priorities of the FY 2023 UPWP include: development of the 2050 MTP base data; update of the regional travel demand model (TDM); implementation of the ACOG MPO Active Transportation Plan; development of the FFY 2024-2027 ACOG MPO TIP and continue coordination with local governments regarding federal transportation funding opportunities. Other priorities entail update of the regional Intelligent Transportation

Systems (ITS) Architecture and Deployment Plan in coordination with ODOT; continuation of the bicycle and pedestrian public safety campaign in coordination member local governments; update of the Congestion Management Process and associated toolbox; development of a regional air quality plan; review of MPO public outreach strategies; air quality planning and compliance with the federal transportation law; and monitor emerging transportation system issues and technologies. The work program recognizes a continuation of data collection efforts, through subcontracts with Oklahoma City, Choctaw, Edmond, Norman, Moore, and Midwest City.

The current regional transportation plan, *Encompass 2045*, was approved by the Metropolitan Planning Organization (MPO) and endorsed by the ACOG Board of Directors in November 2021. This financially constrained Plan includes recommendations for streets and highways, airport access, transit, freight movement, and bicycle and pedestrian facilities.

The work element and task descriptions included in this work program were prepared and approved through the ACOG committee structure which provides technical and policy guidance for the continuing transportation planning process. The work program elements may be revised or amended at any time to reflect improved study procedures. Revisions or amendments must be approved through the Technical and Policy Committee structure.

SPECIAL CONCERNS AND METROPOLITAN PLANNING FACTORS

State, regional, and local priorities are expressed by the ACOG MPO members in development and execution of the planning program. Federal planning emphasis areas are often expressed through legislation or through planning guidance issued by the Federal Highway Administration, the Federal Transit Administration, or the Environmental Protection Agency. The FY 2023 UPWP was development in compliance with the Infrastructure Investment and Jobs Act (IIJA), which was signed into law on November 15, 2021. Current surface transportation legislation requires MPOs to consider ten (10) factors in the transportation planning process. Additionally, the IIJA continues its predecessor's emphasis on financial feasibility, public involvement, consideration of social, economic, and environmental impacts of transportation decisions, and performance-based planning. Substantial work is anticipated during FY 2023 in consideration of these planning requirements. Following is a description of the planning factors and a summary of FY 2023 planning activities applicable to each planning factor.

1. Support economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
 - Task 1.01 (1-8) - compile and analyze data about regional employment and growth
 - Task 1.02 (1-4), Task 2.01 (4), and Task 2.02 (2,5) - compile and analyze information about current and future traffic patterns and travel conditions
 - Task 2.01 (10) - monitor advances in transportation system technology (including connected/autonomous vehicles) and their impact on the movement of people and goods
 - Task 2.01 (6,11,12), Task 2.02 (9-13), and Task 2.05 (10) - promote the use of alternative forms of transportation
 - Task 2.02 (7,8) - provide a process to evaluate proposed TIP projects based on anticipated efficient movement of people and goods
 - Task 2.02 (1) - assist ACOG MPO entities in identifying needed transportation improvements and related funding sources
 - Task 2.01 (7,8,9) and Task 2.02 (4,6) - participate in evaluation of proposed major transportation improvement projects in the metropolitan area
 - Task 2.02 (9-13) and Task 2.04 (1-10) - assess transit needs and promote transit options in ACOG MPO area

- Task 2.03 (1-7) - develop performance-based planning, travel demand, congestion and performance management strategies to improve efficiency of existing system
 - Task 2.04 (2) - participate in maintaining the Coordinated Public Transit-Human Services Transportation Plan and work with state and local partners who provide public transportation services and health and human services, all consistent with the ACOG MPO long-range transportation plan and selected projects that will be included in the Transportation Improvement Program (TIP) and Statewide TIP (STIP)
 - Task 2.05 (1) - continue to study the potential impacts of an Environmental Protection Agency (EPA) ozone nonattainment designation
 - Task 2.05 (3-8) - promote and educate concerning the use alternative fuels
2. Increase safety of the transportation system for motorized and nonmotorized users.
- Task 1.02 (2) - identify bridges and roadways where unsafe conditions underscore the need for prompt improvement
 - Task 2.01 (4) and Task 2.02 (2) - monitor intermodal improvements in the ACOG MPO area
 - Task 2.01 (10) - monitor advances in technology that may lead to increased safety and security of the transportation system
 - Task 2.01 (10) and Task 2.03 (3-6) - promote use of technological solutions, alternate routes, etc. to manage incidents
 - Task 2.02 (1,4,5) - coordinate with ODOT in selecting projects that merit special funding consideration because related safety concerns warrant attention
 - Task 2.02 (7,8) and Task 2.03 (1,2)- consider safety as factor in evaluation of proposed TIP projects
 - Task 2.03 (1-6) - identify locations of recurring congestion and high crash rates and encourage development of appropriate safety and congestion management strategies
 - Task 2.03 (7) - continue programs to protect the safety of transit passengers, vehicles, and transit infrastructure
3. Increase security of the transportation system for motorized and nonmotorized users.
- Task 1.02 (2) - maintain pavement and bridge inventories
 - Task 1.03 (1-7) - maintain an inventory of comprehensive regional base maps
 - Task 2.01 (4) and Task 2.02 (2) - monitor intermodal improvements in the ACOG MPO area
 - Task 2.01 (10) and Task 2.03 (4-6) - promote the use of technology to enhance the security of roadway infrastructure
 - Task 2.03 (7) - promote the use of technology to enhance transit service security
 - Task 2.03 (6,7) - coordinate with homeland security and emergency management related agencies and committees
4. Increase accessibility and mobility options available to people and freight.
- Task 1.01 (1-8) - assemble and analyze demographic, socioeconomic and land use data to simulate the current and planned land development patterns in which the transportation system must operate
 - Task 1.01 (1-8), Task 2.01 (4,11,12), Task 2.02 (9-13) and Task 2.04 (1-6,8,9) - assess transit needs and promote transit options in ACOG MPO area
 - Task 1.01 (5) and Task 2.01 (4,5,7,8,10) - enhance the forecasting ability of regional models

- Task 1.01 (7), Task 3.01 (5-9), and Task 4.01 (6,7) - ensure compliance with civil rights laws and other guidelines calling for access to information about, and options related to, transportation choices
 - Task 1.02 (4), Task 2.02 (9,12), and Task 2.04 (2) - maintain a current transit database that documents characteristics of bus service available to metropolitan area travelers
 - Task 2.01 (2) - process Plan amendments that meet the public involvement, fiscal constraint, and air quality thresholds, and demonstrate the ability to improve mobility for movement of people and freight
 - Task 2.01 (4,5) and Task 2.02 (2) - collect and analyze network data to improve the efficiency of existing and future ACOG MPO area transportation networks
 - Task 2.01 (11,12) and Task 2.04 (6,8-10) - promote regional transit discussion
 - Task 2.02 (2,5) - continue working with ODOT and other states on freight and trade
 - Task 2.02 (3) - maintain current information on federal functional classification network and analyze major investments which can increase mobility options
5. Protect and enhance the environment, promote energy conservation, and improve quality of life, and promote consistency between transportation improvements and state and local planned growth and economic development patterns.
- Task 1.01 (1-8) - evaluate social, environmental, land use and economic impacts of transportation plans
 - Task 1.01 (1-4,7,8) and Task 1.03 (1-7) - maintain geographic information system (GIS) that allows integrated analysis of various layers of data as they affect the human population and transportation network
 - Task 2.01 (8,9) - coordinate with ODOT and the Oklahoma Turnpike Authority (OTA) with regard to statewide transportation network improvements
 - Task 2.01 (10) - coordinate with regional partners to continue to utilize the 2019 Oklahoma City Metropolitan Area Tree Canopy Study
 - Task 2.01 (11,12) and Task 2.04 (6,8-10) - determine regional desire to develop and promote transit priorities
 - Task 2.02 (1) - monitor implementation of selected Transportation Alternatives Program (TAP) projects
 - Task 2.02 (6) - develop a planning process that can be integrated into the required environmental analysis for major highway and transit projects
 - Task 2.03 (1-6) - improve the efficiency of the current transportation system
 - Task 2.04 (1-5) - continue provision of paratransit services for the elderly and individuals with disabilities
 - Task 2.04 (2) - participate in maintaining the Coordinated Public Transit-Human Services Transportation Plan and work with state and local partners who provide public transportation services and health and human services, all consistent with the ACOG MPO long-range transportation plan and selected projects that will be included in the Transportation Improvement Program (TIP) and Statewide TIP (STIP)
 - Task 2.05 (1) - continue to study the potential impacts of an Environmental Protection Agency (EPA) ozone nonattainment designation
 - Task 2.05 (1-8) - monitor air quality in the metropolitan area, and implement measures to improve air quality, including promotion of alternative forms of transportation, use of clean fuels, implementation of transportation system management strategies
 - Task 3.01 (1-11) - maintain contact with area citizens and business with a focus on receiving and providing information that can help to improve the transportation system and quality of life for the metropolitan area

6. Enhance integration and connectivity of the transportation system, across and between modes, and for people and freight.

- Task 1.03 (1), Task 2.01 (4), and Task 2.02 (2) - monitor and map the continuing development of the intermodal regional transportation network, including transit, bicycle and pedestrian trail strategies
- Task 2.01 (8,9) - coordinate with ODOT and OTA with regard to statewide transportation network improvements
- Task 2.01 (11,12) - integration of regional public transportation
- Task 2.02 (3,4) - maintain updated functional classification system, and cooperate with ODOT in selection of projects for funding under the NHS, Bridge, and Interstate programs
- Task 2.02 (7) - provide input for development of ODOT's Eight Year Construction Program and State TIP
- Task 2.02 (9,12) - maintain transit route and scheduling database that assists in continuous internal review of bus route performance
- Task 2.05 (8) - support regional rideshare programs

7. Promote efficient system management and operation.

- Task 1.01 (1-8) - assemble and analyze demographic, socioeconomic and land use data to simulate the current and planned land development patterns in which the transportation system must operate
- Task 1.02 (2) - maintain an online management system (e-TIP) for transportation project tracking and evaluation and assist with the implementation of ODOT's new e-STIP
- Task 2.01 (1-3,5) - develop and maintain fiscally constrained long-range transportation plan
- Task 2.01 (4,5,7,10,11,12) - analyze future travel demand
- Task 2.02(1) - monitor federally funded transportation improvements and provide periodic status reports
- Task 2.02 (7) - provide a process to evaluate proposed TIP projects based on anticipated efficient movement of people and goods
- Task 2.03 (1-5) - develop strategies to alleviate congestion and enhance mobility
- Task 2.03 (5) - explore the establishment of a regional construction coordination program to ensure that construction and temporary closures will pose the least burden to the traveling public

8. Emphasize preservation of the existing transportation system.

- Task 1.01 (1-7) - assemble and analyze demographic, socioeconomic and land use data to simulate the current and planned land development patterns in which the transportation system must operate
- Task 1.02 (1-4) - data collection of existing traffic and transportation conditions, strategic roadways, public transportation, and goods movement
- Task 1.03 (1), Task 2.01 (4), and Task 2.02 (2) - monitor and map the continuing development of the intermodal regional transportation network, including transit, bicycle and pedestrian trail strategies (network monitoring)
- Task 2.03 (1-5) - utilize congestion management and intelligent transportation technology to maximize efficient use of the existing transportation system (performance-based planning and management)

9. Improve resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation.
 - Task 1.01 (4) – track local member land use developments and comprehensive plans
 - Task 1.01 (5) – explore methodologies for use with the 2050 land use scenarios
 - Task 1.02 (1-4), Task 2.01(4), and Task 2.02 (2,5) – compile and analyze information about current and future traffic patterns and travel conditions
 - Task 1.03 (1), Task 2.01 (4), and Task 2.02 (2) – monitor and map the continuing development of the intermodal regional transportation network, including transit, bicycle and pedestrian trail strategies (network monitoring)
 - Task 2.01 (10) – coordinate with regional partners to continue to utilize the 2019 Oklahoma City Metropolitan Area Tree Canopy Study
 - Task 2.03 (1-5) – utilize congestion management and intelligent transportation technology to maximize efficient use of the existing transportation system (performance-based planning and management)
10. Enhance travel and tourism.
 - Task 2.01 (8,9) – coordinate with ODOT and OTA with regard to statewide transportation network improvements
 - Task 2.01 (11,12) and Task 2.04 (6,8-10) – promote regional transit discussion
 - Task 2.02 (9-13) and Task 2.04 (1-10) – assess transit needs and promote transit options in ACOG MPO area
 - Task 2.05 (3,9), and Task 3.01 (11) – coordinate with partners to promote livability principles, complete streets, healthy communities, and walkability
 - Task 2.03 (1-5) – utilize congestion management and intelligent transportation technology to maximize efficient use of the existing transportation system (performance-based planning and management)

Additionally, the ACOG MPO planning process must include the following activities. These responsibilities are carried out through the completion of work program tasks as well.

1. Publish public involvement procedures that support early and continuing involvement of citizens, affected public agencies, transportation agency employees, private providers of transportation, public transit users, freight shippers, and other interested parties in the development of the transportation plans and transportation improvement programs (TIPs).
2. Comply with Title VI of the Civil Rights Act of 1964, the Presidential Order on Environmental Justice, and the State's assurance of nondiscrimination under any program receiving U.S. Department of Transportation (DOT) assistance.
3. Identify actions necessary to comply with the Americans with Disabilities Act of 1990 and applicable U.S. DOT regulations.
4. Provide for the involvement of traffic, rideshare, and parking agencies; airport and port authorities; and appropriate private transportation providers.
5. Provide for involvement of local, state, and federal environmental resource and permit agencies.
6. Include preparation of technical reports to assure documentation of the redevelopment, refinement, and reappraisal of the transportation plan.
7. Develop and maintain a long-range intermodal regional transportation plan that is fiscally constrained and addresses at least a 20-year period.
8. Develop/update a transportation improvement program (TIP) every year in cooperation with the State and public transit operators. The TIP must be fiscally constrained by year and may identify illustrative projects.

PART 4: ACCOMPLISHMENTS OF FY 2022

DATA DEVELOPMENT AND COMPREHENSIVE PLANNING

Socioeconomic Data, Scenario Planning, and Census Programs

The MPO finalized collection of socioeconomic data (land use, population, employment, school enrollment, etc.) for use in the development of the 2045 Metropolitan Transportation Plan (MTP). In addition, residential and commercial building permits through 2020 were collected from member entities to determine the most recent growth trends in the region. Staff began work to collect 2020 base year data for use in the 2050 MTP.

In FY 2022, MPO staff continued work on the 2045 land use scenarios which included both a trend development and nodal/infill development scenarios, and a to review the 2040 scenario methodology and evaluate possible updates and changes for the 2045 MTP. Staff also began collecting development and environmental data for use in the 2050 land use scenarios.

ACOG's Areawide Planning and Technical Advisory Committee (APTAC) remains a conduit for regional planning coordination. In FY 2022, the committee was presented information on local tree ordinances, Watch for Me OK and other bike and pedestrian planning efforts, regional population and building permit data, the ACOG Complete Streets Policy, regional ozone and air quality planning, zoning, professional development, technical assistance, and funding opportunities.

The MPO started to receive 2020 Census products. The 2020 census geographic data for tracts, block groups, and blocks were downloaded from the Census Bureau. Some of this data will be used in the development of the 2050 MTP.

Transportation Planning Data

MPO staff continued to work closely with several member entities in an effort to populate the online traffic count database system (TCDS) and mapping service, first procured in FY 2009. The regional traffic count data was utilized by ACOG for a number of planning initiatives including monitoring activities related to the Congestion Management Process, crash analysis, and for response to individual data requests. Along with vehicular traffic counts, the MPO also compiles bicycle and pedestrian count data. Bicycle and pedestrian counts are collected in the spring and fall of each year. ACOG continued to provide funding through the traffic count program for these regional bicycle and pedestrian count collection efforts. ACOG also utilized permanent bicycle and pedestrian counters located around the region to collect non-vehicular count data.

In 2013, the Federal Highway Administration (FHWA) began providing a National Performance Management Research Data Set (NPMRDS) to MPOs and state DOTs. The data set consists of vehicle travel time data on the interstate and non-interstate national highway system (NHS) and was provided to assist MPOs and DOTs with performance management activities, as required by MAP-21 and continued under the current surface transportation legislation. The MPO continues to compile and analyze the data in accordance with performance management regulations. The data set has also been analyzed as part of the congestion management process to help identify congested corridors within the region.

In FY 2022, ACOG continued to assist ODOT with transportation data and modeling for a study of the I-35 corridor, in partnership with the cities of Moore and Norman.

Geographic Information Systems

The MPO is uniquely situated to aid member communities with their GIS needs and has the potential to serve as the regional repository for many data sets, foster regional collaboration and improve regional data editing processes. In FY 2022, ACOG renewed its subscription to several online services. Staff continued an ArcGIS Online account, ESRI's online mapping and hosting platform that allows users to create and publish interactive GIS applications. Maps created using ArcGIS Online have been linked to documents and presentations as well as embedded in ACOG's numerous webpages, aiding staff in the dissemination of data. For instance, interactive maps produced using ArcGIS Online have been used as part of the FY 2022 call for STBG-UZA projects, as well as the display of regional crash data analysis, data from the Tree Canopy Assessment, and numerous 2045 MTP-related maps. ACOG has continued using ArcGIS Online to provide GIS assistance to member entities, creating maps used by members at city council meetings and other public involvement efforts. Along with ArcGIS Online, ACOG continues to update and maintain its online mapping application. In FY 2022, ACOG staff continued to transition the agency's GIS to a cloud-based environment. By switching to a cloud-based GIS, ACOG staff will be able to serve its members more efficiently and effectively. A cloud-based GIS also provides greater flexibility in accessing the agency's data, in case of emergencies. ACOG staff were able to utilize this system during the COVID-19 pandemic shutdown.

As with previous years, the MPO provided coordination and assistance in the regional acquisition on aerial imagery and other digital products. The 2021 data will allow the MPO staff to verify land use and transportation project status for the 2045 MTP.

LONG-RANGE TRANSPORTATION PLANNING

Metropolitan Transportation Plan - Encompass 2045

In FY 2022, finalized the 2045 MTP update, which included compiling base and future year data (land use, population, employment, school enrollment, and building permits), and updating the regional land use and travel demand models. Staff also collected data to update the transit, bicycle and pedestrian, freight, and Intelligent Transportation Systems (ITS) portions of the Plan. Staff created and executed an Encompass 2045 Public Outreach Plan which included a Stakeholder Advisory Group (SAG), public surveys, virtual outreach events, enhanced ACOG website and social media, opportunities for accessibility such as translated documents, and opportunity for public comment. No public comments were received regarding Encompass 2045, although the public and stakeholder feedback received from the surveys, SAG meetings, and virtual events were all included in the final plan.

On November 18, 2021, the Intermodal Transportation Policy Committee approved Encompass 2045, Central Oklahoma's MTP. Encompass 2045 is a long-term vision for the region's transportation system based upon locally developed goals and strategies. The plan identifies affordable major transportation investments that provide the best transportation solutions to accomplish the region's goals.

There were no Encompass 2040 or 2045 project amendment requests in FY 2022.

Urban Tree Canopy Study

ACOG partnered with the Oklahoma City Community Foundation (OCCF) and the Oklahoma Forestry Service on a regional tree canopy study in 2019. The study analyzed the urban tree canopy in Central Oklahoma and provided each agency with data to make informed decisions regarding various projects and programs. For ACOG, the data has been used in a number of projects, including resiliency efforts, livability and complete streets initiatives, scenario

planning efforts, and advanced regional air quality modeling and planning. The data is available to member communities to aid in planning efforts in their communities. ACOG maintains a webpage and an ArcGIS Hub site where users can read the full report, view maps and story maps, and download data.

Connected and Autonomous Vehicles

In FY 2022, the MPO continued to focus its attention on connected and autonomous vehicles, mainly by reviewing the latest news and research on the topic. ACOG was also invited to participate in the Driving Oklahoma Workgroup, an initiative established by the Oklahoma Secretary of Transportation to focus on connected and autonomous vehicle implementation within the state.

SHORT-RANGE TRANSPORTATION PLANNING

Monitoring Urbanized Area Funds

The MPO continued coordination with the Oklahoma Department of Transportation and local governments located in the Transportation Management Area concerning distribution, programming, and monitoring of federal Surface Transportation Block Grant - Urbanized Area (STBG-UZA) funds. Area STBG-UZA funds were based on the combined Census 2010 populations of the Oklahoma City and Norman Urbanized Areas per Sec. 6016 of the FAST Act. In FY 2020, staff provided a project submittal workshop to educate member communities on the process of submitting a project using the updated scoring criteria and electronic TIP (known as eTRACKER). Project sponsors continue to submit projects through eTRACKER, which was upgraded in FY 2022.

The updated and adopted *Surface Transportation Block Grant (STBG) Procedures for the Oklahoma City Urbanized Area Funds and Criteria and Process for Evaluation of STBG-UZA Projects* continued to serve as the MPO's policy for selecting project priorities using urbanized area funds. The STBG Procedures allow entities within the TMA boundary to apply for STBG-UZA funding. In FY 2020, ACOG's Technical and Policy committees approved a 10 percent cap on all stand-alone bicycle and pedestrian-related projects. The committees also approved various changes to the Criteria to ensure consistency with the MPO's goals and objectives. The MPO continued to manage and update the STBG-UZA Project Scoring Criteria Dashboard—an ArcGIS Online Dashboard where entities can score and submit projects for STBG-UZA funding consideration.

The Criteria and Process for Evaluation is assessed annually to ensure project scoring best meets the needs and priorities of the region.

Federal Functional Classification System

The MPO continued to review potential requests by member entities to amend the Federal Functional Classification System to reflect local needs and priorities. Any MPO recommendations were forwarded to ODOT for review and final action by the Federal Highway Administration.

Transit Operations

Transit services within the Central Oklahoma TMA continued to be provided through three urban transit systems. The EMBARK bus system, operated by the Central Oklahoma Transportation and Parking Authority (COTPA), serves the Oklahoma City Urbanized Area, with service to Midwest City, Spencer, and Warr Acres; Citylink, operated by McDonald Transit, serves the City of Edmond in the northern portion of the Oklahoma City Urbanized

Area; and the City of Norman, operated by EMBARK, serves the Norman Urbanized Area. The 2010 census maintained separate urbanized Area (UZA) designations for the Oklahoma City and Norman UZAs, and both are designated recipients for FTA Sec. 5307 funds. In FY 2019, the University of Oklahoma administration decided to provide transit services on campus, but not in the community. CART's transition to a new, smaller service area began on July 1, 2019. The City of Norman continues to maintain the remaining Norman routes through a partnership with EMBARK.

Rural transit service was provided by First Capital Trolley, Central Oklahoma Community Transit System (COTS), Delta Public Transit, Washita Valley Transit, and Red River Transportation Service.

The MPO, COTPA, City of Norman Transit, Edmond Citylink, Oklahoma City Planning, and ODOT staff members met quarterly throughout FY 2022 to coordinate on regional planning and transit activities. The MPO continued to monitor changes and updates to regional transit networks, collect monthly ridership data, track the development of Transit Asset Management (TAM) performance measures, and assist transit providers with data analysis.

Enhancements and Bicycle/Pedestrian Facilities

In FY 2022, the seventeenth annual National Bike Month campaign in the ACOG TMA area was held during the month of May. ACOG planned a bicycle festival (BikeFest) to kick off Bike Month. BikeFest is a family friendly festival that celebrates bicycling for transportation, recreation and health. This event featured local bike shops, community organizations, and had activities like free spin classes and bicycle maintenance demonstrations. ACOG also organized an areawide bicycle scavenger hunt, which took place over the entire month of May. This event encouraged resident to explore their community and experience the benefits of bicycling for transportation first-hand. The scavenger hunt listed twenty (20) general locations that could be found in local communities.

Bike to Work Week was held on May 16 - 22, with Bike to Work Day on May 20. The communities of Guthrie, Edmond, Moore, Norman, Oklahoma City, Piedmont, Yukon, and Tinker Airforce Base hosted Bike to Work Day events. All ACOG communities are encouraged to participate. The Bike to Work Day webpage was updated on the ACOG website to notify residents about the events this year.

In May 2021 the ACOG Board of Directors adopted the Regional Active Transportation Plan. This plan combined the previous Bicycle Plan and Pedestrian Plan into once comprehensive active transportation plan for the region. This plan includes a series of long-term goals and objectives that form the basis for recommendations and prioritization. Priority areas and corridors are identified, along with several implementation strategies and recommendations to help the region achieve a robust active transportation network.

The MPO's Active Transportation Advisory Committee (ATAC), formerly the Bicycle-Pedestrian Advisory Committee (BPAC), continues to disseminate regional bike, pedestrian, transit, and micromobility information and coordinate regional trails development. Among the presentations given to the committee over the past year include presentations on bike/pedestrian counts, member communities' trail openings, Eco-Counter presentations, updates on the Watch for Me OK bicycle and pedestrian safety campaign, Regional Active Transportation Plan updates, Transportation Alternatives Program grants, Air Quality Small Grant program, bike month planning, and training and grant opportunities.

Performance Based Planning Process

As part of Encompass 2045, the MPO analyzed a list of performance measures to monitor and evaluate the effectiveness of transportation investment in the region. Federally required performance measures as well as measures focusing on local priorities were included in the document. In March 2018, MPO staff set targets for the first set of measures centered on the safety of the transportation system in coordination with ODOT, OHSO, and FHWA. In FY 2019, staff set targets, in coordination with ODOT, for the nine remaining performance measures for bridge and pavement condition, as well as system performance. The targets were approved by the ITTC and ITPC in October 2018. ACOG committees also approved updated safety targets (which are set annually) in March 2022. In 2020, ACOG prepared the 'Transportation System Performance Report: Performance Measure Targets and Monitoring.' This report identifies trends and associated targets for each regional and federal performance measure in the MTP.

Recurring Congestion and Congestion Management Process

The ACOG MPO is continually looking for opportunities to increase the efficiency of the existing transportation system. In FY 2017, MPO adopted a new congestion management process (CMP) for the region, in coordination with the 2040 MTP. The CMP update utilized newly available data to quantitatively evaluate the regional transportation system and identify congested corridors. The CMP also includes a set of performance measures to be evaluated on a routine basis, which allows for ongoing monitoring of identified congested corridors and the employed strategies.

In FY 2022, several projects and strategies were implemented to alleviate congestion problems in the TMA. The strategies included traffic operation improvements such as intersection modification, signalization and channelization, deployment of Intelligent Transportation Systems related infrastructure, interchange improvements, improved bus service, and the addition of general-purpose lanes.

Non-Recurring Congestion and Traffic Incident Management (TIM)

Non-recurring congestion and traffic incidents make up a large portion of the ACOG MPO area congestion. Current surface transportation legislation prescribes that incident caused congestion mitigation to be a part of the overall CMP, thus bringing emphasis not only to overall travel time, but also to travel time reliability.

MPO staff continued their involvement with the statewide Traffic Incident Management (TIM) coalition and ACOG hosts the quarterly Statewide Transportation Innovation Council (STIC), which is organized by ODOT and FHWA.

The MPO also continued its involvement in the areawide collaboration associated with the regional snow routes system. Staff maintained contact with MPO entities in order to make sure that the regional snow routes were still accurate and that associated maintenance activities were being carried out as documented. The regional snow routes map is distributed to member entities, posted to social media, and shared with local media outlets.

Intelligent Transportation Systems

The MPO continued, in close coordination with the Oklahoma Department of Transportation (ODOT), to realize its vision for Intelligent Transportation Systems (ITS) within the MPO area.

Safety Conscious Planning

The MPO is committed to providing a safe environment for the traveling public and has a track record of considering safety as an important factor in the development of the Transportation Improvement Program and the long-range transportation plan.

The MPO coordinated with ODOT and public safety officials in the collection and analysis of traffic crash data and the setting regional safety targets. In June 2020, the MPO completed the ACOG Regional Crash and Safety Report. In this report, staff performed various crash analyses to identify high crash locations throughout the MPO area.

Staff also applied for and was awarded another year of funding from the Oklahoma Highway Safety Office (OHSO) Highway Safety Grant. The grant, i focuses on increasing the overall visibility of pedestrian and bicyclist safety issues through public service messages and community engagement efforts, such as special events and partnerships. The program also provides educational materials to area leaders such as government staff, pedestrian and bicycle advocates, city planners, law enforcement agencies, engineers, public health professionals, the media, influencers, elected officials, parents, and educators. The goal of this campaign is to reduce the total number of pedestrian and bicycle crashes and fatalities in Central Oklahoma.

Additionally, MPO staff attended coordination meetings with ODOT and statewide stakeholders regarding creation of the State Highway Safety Plan (SHSP).

Freight and Intermodal Transportation Planning

The MPO stayed apprised of the state-led Commercial Vehicle Operations (CVO) activities, as well as the ongoing Commercial Vehicle Information Network System (CVISN) planning and deployment.

AIR QUALITY

Air Quality Monitoring

The MPO continued to work with the Air Quality Division of the Oklahoma Department of Environmental Quality (ODEQ) on monitoring and evaluating ground-level ozone (O₃) and particulate matter (PM_{2.5} & PM₁₀) levels in Central Oklahoma.

In October 2015, EPA revised the primary and secondary ozone standard levels to 0.070 parts per million (ppm), and retained their indicators (O₃), forms (fourth-highest daily maximum, averaged across three consecutive years) and averaging times (eight hours). EPA's panel of science advisors, the Clean Air Scientific Advisory Committee (CASAC) had recommended to EPA that 60 parts per billion (ppb) be the lower limit of the range in June 2014. In December 2017, all seventy-seven counties in Oklahoma were designated 'Attainment/Unclassifiable The Oklahoma Department of Environmental Quality (ODEQ), Air Quality Division, in collaboration with the Association of Central Oklahoma Governments (ACOG), formally submits an Oklahoma City Metropolitan area path forward letter as required by participation in the EPA's Ozone Advance program. This is a "living" document and will be updated as programs are added or evolve. The document includes a list of Ozone Advance initiatives and ongoing programs for the Oklahoma City Metropolitan Statistical Area (MSA), comprised of Canadian, Cleveland, Grady, Lincoln, Logan, McClain, and Oklahoma counties, for which reports are provided to EPA on an annual basis. The Oklahoma City MSA report was submitted to EPA in May 2021.

The ground-level ozone reduction programs include voluntary and mandatory measures, as allowed in the EPA Ozone Advance Guidance Document. This mix of programs allows for more expeditious implementation and provides flexibility for program stakeholders.

The Oklahoma City MSA had a design value of 0.070 in 2021.

Air Quality Public Awareness Campaign

The MPO continued administration of a comprehensive public education program on air quality and its requisite impacts on regional health, the economy and quality of life, including its effect on the transportation sector. The program has been funded primarily from Congestion Mitigation Air Quality (CMAQ) funds provided by the Oklahoma Department of Transportation (ODOT).

Social media and online platforms remain essential tools in raising awareness about Central Oklahoma's air quality. Social media such as Twitter and Facebook are cost-efficient methods of reaching wide audiences. Constant Contact is utilized to send email notifications of Ozone Alert Day declarations. In 2018, the MPO added a Spanish language translation for the Ozone Alert message. A text alert option launched in Spring 2019 and a new campaign 'Get in the #KNOWZONE' was launched in Spring 2020.

Public Fleet Conversion Grant Program

Congestion Mitigation and Air Quality (CMAQ) funds assigned to the ACOG MPO area provided funding for projects that entail fleet conversion to clean fuel technologies, the purchase of alternative fuel vehicles and hybrid vehicles, and/or the deployment of alternative fuel vehicle fueling and charging infrastructure. ACOG MPO member entities, public trusts and public authorities providing essential services to ACOG MPO member entities, public colleges and universities, public technical education centers, and public school districts located principally within the ACOG MPO boundary were eligible to participate.

The MPO issued a call for competitive project applications under its FY 2022 Public Fleet Conversion Grants process in October 2021 and four projects were awarded. City of Midwest City, City of Moore, City of Norman, and the Oklahoma Environmental Management Authority (OEMA) were awarded funding to defray costs related to the purchase of new compressed natural gas (CNG) vehicles and electric vehicle (EV) charging infrastructure. Funding for new alternative fuel vehicles, hybrid vehicles and advanced technology vehicles was limited to the incremental cost of those vehicles and required a minimum 20 percent local cost share with maximum 80 percent federal share. Grantees are required to remove older vehicles to be replaced by the purchase of new alternative fuel vehicles. Alternative fuel charging and fueling infrastructure also required a minimum 20 percent local share.

Electric Vehicle Adoption

The MPO through the Central Oklahoma Clean Cities program has prioritized electric vehicle charging station planning and technical assistance to take advantage of public and private sector investment in transportation electrification.

Oklahoma now has the third most electric vehicle fast charging stations (per capita) in the United States and in 2021 had the largest increase in EV sales as a percentage of light duty vehicle sales.

The MPO, through the Central Oklahoma Clean Cities program administers the Oklahoma Electric Vehicle Coalition, an informal working group of stakeholders addressing EV adoption opportunities and barriers.

Air Quality Small Grant Program

In 2014, the MPO launched a one-year pilot grant program to use CMAQ funds for small active transportation infrastructure and public education programs for the betterment of regional air quality. Based on feedback from member communities, ACOG relaunched the program in 2018, focusing on small transportation infrastructure projects and congestion relief efforts. Since 2018, ten projects have been awarded funding through a competitive grant process. Awarded projects include bicycle lanes, bicycle racks, and bus stops from Oklahoma City, Norman, Edmond, and Midwest City.

SPECIAL PROJECTS

Regional Transportation Authority

For over ten years, ACOG helped guide regional commuter rail studies. In February 2019, six communities (Del City, Edmond, Midwest City, Moore, Norman, and Oklahoma City) signed a trust indenture officially forming the Regional Transportation Authority (RTA) of Central Oklahoma. ACOG continued to provide administrative, technical, and legal support to the newly formed organization until February 2020, when COTPA began providing administrative support for the organization. ACOG has continued to monitor and promote a regional commuter rail service and enhanced bus options.

Cost of Nonattainment Study

In FY 2022, ACOG completed a study on the potential regional economic impacts of an Environmental Protection Agency (EPA) ozone nonattainment designation. The analysis focused on the cost of regulatory requirements of a nonattainment designation including transportation conformity, facility emissions reductions, and an economic impact analysis. A Scoping Report was released in May 2020 and a full report was released in June 2022.

TRANSPORTATION SERVICES FOR THE ELDERLY AND PERSONS WITH DISABILITIES

As required by the Americans with Disabilities Act, COTPA, City of Norman Transit, and Citylink provide paratransit services for Central Oklahoma's with a qualifying disability. ACOG, COTPA, the City of Norman, and Citylink continue to be involved in efforts to improve transportation choices for persons with disabilities and persons with low/moderate income.

Title VI/ADA

ACOG continued to include an accommodation statement (inclusive of all disabilities) on its monthly agendas. Staff created an email address specifically for Title VI and ADA inquiries and complaints. The following documents were updated in FY 2022: ADA/504 Compliance Plan, ADA Complaint Process and Form, Title VI Plan, Title VI Complaint Process and Form. Additionally, Title VI Assurances were reviewed and signed by ACOG's Executive Director. A translation notice was also created to inform on the availability of translated documents. ACOG maintained its website with all available Title VI, ADA, PPP, and EJ documents and forms. An accessibility plug-in called Userway was purchased and activated on ACOG's website which includes functions such as larger text, dyslexia friendly text, and contrasting colors.

PROGRAM SUPPORT AND ADMINISTRATION

Transportation Improvement Program

In FY 2018, ODOT, Oklahoma's MPOs, and FHWA coordinated to revise the STIP/TIP development procedures to ensure that the MPOs' and ODOT's transportation plans are updated every two years instead of three. Complying with the updated procedures, ACOG developed another new TIP in FY 2021—the FFY 2022 – 2025 Transportation Improvement Program (TIP)

The FFY 2022-2025 TIP identified the region's priorities for expenditure of federal-aid transportation funds within the MPO area and incorporated transportation projects selected during the FY 2021 Call for Projects for STBG-UZA funding. The TIP document also incorporates language to reflect the federal performance-based planning and programming requirements. The FFY 2022-2025 TIP went into effect in October 2021, after approval by ODOT and FHWA.

The FFY 2022-2025 Transportation Improvement Program was updated during FY 2022 to reflect local projects selected for STBG-UZA funding during the FY 2022 Call for Projects. Amendments to the program were made, as needed, financial constraint was maintained, and opportunity for public comment on all amendments was provided. All amendments were adopted by the MPO and submitted to ODOT for approval and amendment of the STIP.

MPO staff continued to implement 'eTRACKER,' an electronic Transportation Improvement Program system, or database, for electronic submission of STBG project applications and project monitoring. ODOT has adopted a similar system for state-sponsored projects.

Public Involvement Program

The *ACOG Public Participation Plan (PPP)* guided public involvement activities related to the Metropolitan Transportation Plan, the Transportation Improvement Program, and other transportation planning activities.

The MPO continued to utilize media releases, newsletters, and e-news releases distributed to ACOG's social media suite. During the development of Encompass 2045, staff created a Stakeholder Advisory Group to inform and receive feedback on the MTP. Staff provided information to stakeholders and the public about the transportation planning process through ACOG's website, blog, social media, virtual engagement events, and online surveys. The MPO utilized visualization techniques in all presentations, including PowerPoint presentations, maps, charts, pictures, and other graphics. MPO staff continued their involvement in several regional outreach events, including GIS Day at the State Capitol, OKSCAUG, and National Bike Month/Bike to Work Day.

Quadrennial Certification Review

MPO staff completed the **seventh** joint evaluation of the Central Oklahoma transportation planning process, conducted by FHWA and FTA, in October 2020. In FY 2021, FHWA and FTA issued their final report jointly certifying that the transportation planning process substantially meets the requirements of 23 CFR Part 450.336.

Technical Assistance

The MPO continues to provide considerable technical assistance to its member local governments, private consultants working for local staff, other agencies, non-profits, and the public.

PART 5: FY 2023 UNIFIED PLANNING WORK PROGRAM BUDGET

The Federal Highway planning transportation funds are provided at an 80 percent federal share. A local share of 20 percent must be provided in order to leverage these federal funds. This local non-federal match can provide a heavy burden on ACOG MPO members. Since 2007, ACOG MPO members have been allowed to use ODOT staff time as non-federal match. The staff time is for transportation work completed by ODOT in the ACOG MPO area. The non-federal match information can be found on Table 5-2.

FY 2023 UPWP

**TABLE 5-1a
EXPECTED PLANNING FUNDS**

Funding Sources	Allocation	Match	Total
FHWA (PL)	\$2,577,894	\$644,477	\$3,222,371
SS4A	\$200,000	\$50,000	\$250,000
FTA 5303	\$274,061	\$68,515	\$342,576
FTA 5307	\$545,463	\$136,366	\$681,829
ODOT (FHWA-SPR)	\$30,000	\$0	\$30,000
LOCAL	\$0	\$0	\$0
GRAND TOTAL	\$3,627,418	\$899,358	\$4,526,776

**TABLE 5-1b
PLANNING FUND DISTRIBUTION**

Source	ACOG	OKC TM	NORMAN & COTPA	SUB. ENT.	ODOT	TOTAL
FHWA (PL)	\$2,330,184	\$201,510	\$0	\$46,200	\$0	\$2,577,894
SS4A	\$200,000	\$0	\$0	\$0	\$0	\$200,000
FTA 5303	\$44,061	\$0	\$230,000	\$0	\$0	\$274,061
FTA 5307	\$0	\$0	\$545,463	\$0	\$0	\$545,463
ODOT (FHWA-SPR) **	\$0	\$0	\$0	\$0	\$30,000	\$30,000
LOCAL TRANSIT	\$0	\$0	\$193,866	\$0	\$0	\$193,866
LOCAL ACOG	\$89,143	\$0	\$0	\$0	\$0	\$89,143
LOCAL ENTITIES	\$0	\$50,378	\$0	\$11,550	\$0	\$61,928
ODOT ITS FUNDING	\$554,421	\$0	\$0	\$0	\$0	\$554,421
GRAND TOTAL	\$3,217,809	\$251,888	\$969,329	\$57,750	\$30,000	\$4,526,776

FHWA: ODOT CMAQ & AQ represents federal CMAQ funds from ODOT. See Table 5-2.

OKC TM = Oklahoma City Traffic Management

COTPA = Central Oklahoma Transportation and Parking Authority

Norman = Norman Transit

SUB.ENT.= Choctaw, Edmond, Midwest City, Moore, and Norman

LOCAL = PL/FTA/CMAQ

** ODOT and FHWA State Planning & Research (SPR) funding for Transportation Planning Assistance

TABLE 5-2
FY 2023 UPWP
ACOG PARTICIPATION

No.	Task Description	FEDERAL FUNDS				LOCAL MATCH					TOTAL FUNDS			ACOG Subtotal
		FHWA-PL (80%)	FTA 5303 (80%)	SS4A (80%)	Total Federal (80%)	FHWA-PL (20%)	FTA 5303 (20%)	SS4A (20%)	ODOT Non Federal	Total Local	FHWA-PL	FTA 5303	SS4A	
101	Monitor Soec. Data	\$116,726			\$116,726	\$29,182			\$27,773	\$29,182	\$145,908			\$145,908
102	Trans. Planng. Data	\$100,557			\$100,557	\$25,139			\$23,926	\$25,139	\$125,696			\$125,696
103	Census & GIS	\$116,220			\$116,220	\$29,055			\$27,652	\$29,055	\$145,275			\$145,275
	Subtotal	\$333,503			\$333,503	\$83,376			\$79,351	\$83,376	\$416,879			\$416,879
201	Long Range Plan	\$685,838			\$685,838	\$171,460			\$163,181	\$171,460	\$857,298			\$857,298
202	Short Range Plan	\$46,494			\$46,494	\$11,624			\$11,062	\$11,624	\$58,118			\$58,118
203	Congestion Mgt	\$606,052		\$200,000	\$806,052	\$151,513		\$50,000	\$144,198	\$201,513	\$757,565		\$250,000	\$1,007,565
204	E and D Plan	\$0	\$44,061		\$44,061	\$0	\$11,015		\$0	\$11,015	\$0	\$55,076		\$55,076
205	Air Quality*	\$221,045			\$221,045	\$55,261			\$52,593	\$55,261	\$276,306			\$276,306
	Subtotal	\$1,559,429	\$44,061	\$200,000	\$1,803,490	\$389,858	\$11,015	\$50,000	\$371,034	\$450,873	\$1,949,287	\$55,076	\$250,000	\$2,254,363
301	Citizen Participation	\$69,470			\$69,470	\$17,368			\$16,529	\$17,368	\$86,838			\$86,838
	Subtotal	\$69,470			\$69,470	\$17,368			\$16,529	\$17,368	\$86,838			\$86,838
401	Certification/Coord.	\$128,566			\$128,566	\$32,142			\$30,590	\$32,142	\$160,708			\$160,708
402	Technical Assist.	\$15,894			\$15,894	\$3,974			\$3,782	\$3,974	\$19,868			\$19,868
	Subtotal	\$144,460			\$144,460	\$36,116			\$34,372	\$36,116	\$180,576			\$180,576
501	Staff Training	\$33,849			\$33,849	\$8,462			\$8,054	\$8,462	\$42,311			\$42,311
502	Annual Report/Doc.	\$61,590			\$61,590	\$15,398			\$14,654	\$15,398	\$76,988			\$76,988
	Subtotal	\$95,439			\$95,439	\$23,860			\$22,708	\$23,860	\$119,299			\$119,299
601	Direct Proj.Mgt.	\$127,883			\$127,883	\$31,971			\$30,427	\$31,971	\$159,854			\$159,854
	Subtotal	\$127,883			\$127,883	\$31,971			\$30,427	\$31,971	\$159,854			\$159,854
	Total	\$2,330,184	\$44,061	\$200,000	\$2,574,245	\$582,549	\$11,015	\$50,000	\$554,421	\$643,564	\$2,912,733	\$55,076	\$250,000	\$3,217,809

TABLE 5-3
FY 2023 UPWP
OKLAHOMA CITY TRAFFIC MANAGEMENT

No.	Task Description	FEDERAL FUNDS			LOCAL MATCH				TOTAL FUNDS			OKC TM Subtotal
		PL	FTA 5303	FTA 5307	PL	FTA 5303	FTA 5307	Total Local	PL	FTA 5303	FTA 5307	
101	Monitor Soec. Data	0	0	0	0	0	0	0	0	0	0	0
102	Trans. Planng. Data	\$187,750	0	0	\$46,938	0	0	\$46,938	\$234,688	0	0	\$234,688
103	Census & Geo. In. Sys	0	0	0	0	0	0	0	0	0	0	0
Subtotal		\$187,750	0	0	\$46,938	0	0	\$46,938	\$234,688	0	0	\$234,688
201	Long Range Plan	0	0	0	0	0	0	0	0	0	0	0
202	Short Range Plan	0	0	0	0	0	0	0	0	0	0	0
203	Congestion Mgt	0	0	0	0	0	0	0	0	0	0	0
204	E and D Plan	0	0	0	0	0	0	0	0	0	0	0
205	Air Quality	0	0	0	0	0	0	0	0	0	0	0
Subtotal		0	0	0	0	0	0	0	0	0	0	0
301	Citizen Part. System	0	0	0	0	0	0	0	0	0	0	0
Subtotal		0	0	0	0	0	0	0	0	0	0	0
401	Certification/Coord.	0	0	0	0	0	0	0	0	0	0	0
402	Technical Assist.	0	0	0	0	0	0	0	0	0	0	0
Subtotal		0	0	0	0	0	0	0	0	0	0	0
501	Staff Training	\$7,680	0	0	\$1,920	0	0	\$1,920	\$9,600	0	0	\$9,600
502	Annual Report/Doc.	\$6,080	0	0	\$1,520	0	0	\$1,520	\$7,600	0	0	\$7,600
Subtotal		\$13,760	0	0	\$3,440	0	0	\$3,440	\$17,200	0	0	\$17,200
601	Direct Proj.Mgt.	0	0	0	0	0	0	0	0	0	0	0
Subtotal		0	0	0	0	0	0	0	0	0	0	0
Total		\$201,510	0	0	\$50,378	0	0	\$50,378	\$251,888	0	0	\$251,888

TABLE 5-4
FY 2023 UPWP
COTPA

No.	Task Description	FEDERAL FUNDS				LOCAL MATCH				TOTAL FUNDS				COTPA TOTAL
		FTA 5307-Staff	RAISE-Studies*	FTA 5303	TOTAL	5307-Staff	RAISE -Studies*	FTA 5303	TOTAL	FTA 5307-Staff	RAISE-Studies*	FTA 5303	TOTAL	
101	Monitor Socio. Data	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
102	Trans. Planning Data	\$ 17,971			\$ 17,971	\$ 4,493	\$ -	\$ -	\$ 4,493	\$ 22,464	\$ -	\$ -	\$ 22,464	\$ 22,464
103	Census & Geo. In. Sys.	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Subtotal	\$ 17,971	\$ -	\$ -	\$ 17,971	\$ 4,493	\$ -	\$ -	\$ 4,493	\$ 22,464	\$ -	\$ -	\$ 22,464	\$ 22,464
201	Long Range Plan	\$ 74,515	\$ 400,000		\$ 474,515	\$ 18,629	\$ 200,000	\$ -	\$ 218,629	\$ 93,144	\$ 600,000	\$ -	\$ 693,144	\$ 693,144
202	Short Range Plan	\$ 294,865		\$ 190,000	\$ 484,865	\$ 73,716	\$ -	\$ 47,500	\$ 121,216	\$ 368,581	\$ -	\$ 237,500	\$ 606,081	\$ 606,081
203	Congestion Mgt	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
204	E and D Plan	\$ 41,567			\$ 41,567	\$ 10,392	\$ -	\$ -	\$ 10,392	\$ 51,959	\$ -	\$ -	\$ 51,959	\$ 51,959
205	Air Quality	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Subtotal	\$ 410,947	\$ 400,000	\$ 190,000	\$ 1,000,947	\$ 102,737	\$ 200,000	\$ 47,500	\$ 350,237	\$ 513,684	\$ 600,000	\$ 237,500	\$ 1,351,184	\$ 1,351,184
301	Citizen Part. System	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Subtotal	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
401	Certification/Coord.	\$ 24,928			\$ 24,928	\$ 6,232	\$ -	\$ -	\$ 6,232	\$ 31,160	\$ -	\$ -	\$ 31,160	\$ 31,160
402	Technical Assist.	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Subtotal	\$ 24,928	\$ -	\$ -	\$ 24,928	\$ 6,232	\$ -	\$ -	\$ 6,232	\$ 31,160	\$ -	\$ -	\$ 31,160	\$ 31,160
501	Staff Training	\$ 1,617			\$ 1,617	\$ 404	\$ -	\$ -	\$ 404	\$ 2,021	\$ -	\$ -	\$ 2,021	\$ 2,021
502	Annual Report/Doc.	\$ -			\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Subtotal	\$ 1,617	\$ -	\$ -	\$ 1,617	\$ 404	\$ -	\$ -	\$ 404	\$ 2,021	\$ -	\$ -	\$ 2,021	\$ 2,021
601	Direct Proj.Mgt.	\$ -		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Subtotal	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
	Total	\$ 455,463	\$ 400,000	\$ 190,000	\$ 1,045,463	\$ 113,866	\$ 200,000	\$ 47,500	\$ 361,366	\$ 569,329	\$ 600,000	\$ 237,500	\$ 1,406,829	\$ 1,406,829

TABLE 5-5
FY 2023 UPWP
City of Norman (CON)

No.	Task Description	FEDERAL FUNDS			LOCAL MATCH			TOTAL FUNDS		
		FTA 5303	FTA 5307	Total FTA	FTA 5303 Local	FTA 5307	Total Local	FTA 5303	FTA 5307	CON
101	Monitor Socio. Data	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
102	Trans. Planning Data	0	\$22,000	\$22,000	0	\$5,500	\$5,500	0	\$27,500	\$27,500
103	Census & GIS	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
Subtotal		0	\$22,000	\$22,000	0	\$5,500	\$5,500	0	\$27,500	\$27,500
201	Long Range Plan	0	\$21,000	\$21,000	0	\$5,250	\$5,250	0	\$26,250	\$26,250
202	Short Range Plan	\$40,000	\$35,000	\$75,000	\$10,000	\$8,750	\$18,750	\$50,000	\$43,750	\$93,750
203	Congestion Mgt	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
204	E and D Plan	0	\$2,000	\$2,000	0	\$500	\$500	0	\$2,500	\$2,500
205	Air Quality	0	\$2,000	\$2,000	0	\$500	\$500	0	\$2,500	\$2,500
Subtotal		0	\$60,000	\$100,000	\$10,000	\$15,000	\$25,000	\$50,000	\$75,000	\$125,000
301	Citizen Part. System	0	\$3,000	\$3,000	0	\$750	\$750	0	\$3,750	\$3,750
Subtotal		0	\$3,000	\$3,000	0	\$750	\$750	0	\$3,750	\$3,750
401	Certification/Coord.	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
402	Technical Assist.	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
Subtotal		0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
501	Staff Training	0	\$5,000	\$5,000	0	\$1,250	\$1,250	0	\$6,250	\$6,250
502	Annual Report/Doc.	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
Subtotal		0	\$5,000	\$5,000	0	\$1,250	\$1,250	0	\$6,250	\$6,250
601	Direct Proj.Mgt.	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
Subtotal		0	\$0	\$0	0	\$0	\$0	0	\$0	\$0
Total		\$40,000	\$90,000	\$130,000	\$10,000	\$22,500	\$32,500	\$50,000	\$112,500	\$162,500

TABLE 5-6
FY 2023 UPWP
SUBURBAN ENTITIES

No.	Task Description	FEDERAL FUNDS			LOCAL MATCH				TOTAL FUNDS			Suburban Entities Subtotal
		PL	FTA 5303	FTA 5307	PL	FTA 5303	FTA 5307	Total Local	PL	FTA 5303	FTA 5307	
102	Trans. Planning Data											
	Choctaw	\$6,800	0	0	\$1,700	0	0	\$1,700	\$8,500	0	0	\$8,500
	Edmond	\$9,800	0	0	\$2,450	0	0	\$2,450	\$12,250	0	0	\$12,250
	Midwest City	\$6,800	0	0	\$1,700	0	0	\$1,700	\$8,500	0	0	\$8,500
	Moore	\$6,800	0	0	\$1,700	0	0	\$1,700	\$8,500	0	0	\$8,500
	Norman	\$16,000	0	0	4,000	0	0	4,000	\$20,000	0	0	\$20,000
Total		\$46,200	0	0	\$11,550	0	0	\$11,550	\$57,750	0	0	\$57,750

PART 6: ELEMENT AND TASK DESCRIPTIONS

ELEMENT #1: DATA DEVELOPMENT AND INFORMATION MANAGEMENT

This element is designed to provide a systematic framework for maintaining, developing, coordinating, integrating, and supporting an areawide urban/regional data management information system. In order to accomplish this, ACOG staff will continue coordination with various federal, state, and local agencies including the U.S. Census Bureau, U.S. Department of Transportation, U.S. Department of Commerce, Oklahoma Department of Environmental Quality, Oklahoma Department of Transportation, and Oklahoma Department of Commerce, for acquisition and analysis of socioeconomic, demographic, and transportation data.

This element produces a continuing inventory of land use, demographic, socioeconomic, and travel data, as well as transportation and transit facilities to assist with monitoring and analyzing changes within the region.

Tasks Included:

[1.01 – Demographic/Socioeconomic Data Monitoring](#)

[1.02 – Transportation Planning Data Management](#)

[1.03 – Geographic Information System Improvements and Census Geography](#)

[1.04 – Transportation Planning Assistance – Oklahoma Department of Transportation](#)

Task 1.01: Demographic/Socioeconomic Data Monitoring

Background Information

A primary function of the MPO is the calibration and application of a regional land use distribution model for the use in the Metropolitan Transportation Plan (MTP). This requires substantial data inputs including base year and forecast year land use, population, employment, dwelling units, and school enrollment within the ACOG MPO area. The regional population and employment forecasts generated by the land use model are critical to the MPO's ability to plan for future traffic congestion.

Program Objective

Prepare for the 2050 Plan.

Program Activities (all activities to be conducted by ACOG)

1. Continue the development of 2020 base year data for the 2050 Plan.
2. Collect and prepare 2020 employment data.
3. Begin the development of school data for the 2020 base year, which will be used in the development of the 2050 land use scenarios.
4. Continue updating the present land use to 2020. Track local land use developments and comprehensive plans for CY 2022 and 2023. Collect building permit data for CY 2021 and CY 2022.
5. Explore methodologies for use with the 2050 land use scenarios.
6. Complete the 2020 Urban Area Boundary analysis. The process will include smoothing out geographic irregularities, maintaining administrative continuity, and incorporating fringe areas having residential, commercial, and/or industrial significance.
7. Provide data, as needed, to project sponsors regarding social, demographic, economic, and environmental impacts of major transportation projects. Assist member communities with the development of local plans and studies.
8. Continue to monitor census products that can be used in model development. Provide census materials and workshops to area members, as needed. Promote annual census programs to members (ACS, BAS). Provide 2020 decennial census products to member entities.

End Product

Technical memoranda and reports documenting program activities, including:

- 1.01 (1-4) – 2020 Base Data Report(s)
 - Population
 - Employment
 - School Enrollment
 - Land Use
 - Building Permits

Task 1.02: Transportation Planning Data Management

Background Information

Transportation planning data is collected every year and compiled in various transportation files at ACOG. Information is placed in new formats, and programs are revised as needed in order to allow greater flexibility and broader reviews of the subject matter.

Program Objective

Collect, maintain, update, and evaluate information that is basic to the transportation planning process regarding current travel and system characteristics, and utilize such information for the assessment of transportation system performance and for forecasting regional travel demand. Data collected is also used to provide a statistical foundation for the identification and prioritization of projects included in the Transportation Improvement Program (TIP).

Program Activities

1. Traffic Count Program

- a. ACOG will compile traffic counts taken by the Oklahoma Department of Transportation (ODOT), Oklahoma City Traffic Management (OKC TM), and the cities of Edmond, Midwest City, Moore, Norman, and Choctaw on key links on the ACOG MPO Plan network yearly or on a rotational basis over a two-year period. Annual counts will be collected for a select number of locations. Participating entities will continue to upload volume, speed, and classification data directly into a hosted, central database available online at acog.ms2soft.com.
- b. ACOG will explore the inclusion of seasonal adjustment factors to ensure the reliability of regional traffic count data. Emphasis on sharing traffic count and transportation system data between the various entities as well as the general public will continue. (ODOT, ACOG, OKC Traffic Management, Edmond, Midwest City, Moore, Norman, and Choctaw)
- c. ACOG will collect bicycle and pedestrian counts taken by participating entities and organize volunteers to conduct counts in fall 2022 and spring 2023. ACOG will continue the agreement with ODOT to utilize their mobile bike counters and will loan ODOT-owned and ACOG-owned counters to local municipalities.

2. Management Systems

- a. ACOG will continue to work cooperatively with the Oklahoma Department of Transportation, affected governmental entities, and private sector groups in the development of the pavement, bridge, and safety management systems, and the congestion management process, as well as the highway performance monitoring system (HPMS).
- b. ACOG will continue to provide traffic counts and lane-width information from the ACOG traffic count database and transportation model to ODOT for the HPMS.
- c. ACOG will continue to maintain its electronic Transportation Improvement Program system (e-TIP), known as eTRACKER, which provides user-friendly, comprehensive, and efficient tools for managing Transportation Improvement Programs (TIP). ACOG will also work with ODOT on the implementation of an electronic Statewide Transportation Improvement Program (e-STIP).

3. Travel Time Analysis (ACOG)

- a. Utilize the National Performance Management Research Data Set (NPMRDS) for the Enhanced NHS within Central Oklahoma to monitor and analyze system performance and congestion.
- b. Include Travel Time Analysis results in the performance measure monitoring report completed by ACOG (see Task 2.03).
- c. Continue to access additional sources for speed/travel time data provided by ODOT.

4. Transit Database and Network Reporting

- a. COTPA, Norman-Transit, and Citylink will collect and analyze ridership data for directly operated and purchased transportation services monthly; ridership figures will be reported to the National Transit Database (NTD) as required. Ridership data by route will be provided to ACOG annually to assist with modeling efforts. (COTPA, Norman-Transit)
- b. COTPA continues to publish and maintain static and LIVE GTFS data feeds to reflect edits and changes made in the transit system for both transit services in Oklahoma City and Norman. Financial data is continually monitored for accurate functional allocation for all reporting modes. (COTPA, Norman-Transit)

End Product

Computerized database files. Technical memoranda and reports as required, documenting the findings and analysis of data collected under these program activities, including:

- 1.02 (1a) – Traffic Counts Data Collection reports (Choctaw, Edmond, Midwest City, Moore, Norman, Oklahoma City TM)
- 1.02 (1c) – Bicycle and Pedestrian Count Data Collection reports
- 1.02 (4) – Annual National Transit Data Reports to FTA (COTPA, Norman-Transit, Citylink)

Task 1.03: Geographic Information System (GIS) Improvements and Census Geography

Program Objectives

Maintain an accurate geographic information system (GIS) of all data relevant to the regional transportation planning process, including but not limited to the street network, transportation projects, functional class, bicycle/pedestrian facilities, crash data, traffic counts, traffic congestion and corridors, parks and open space, administrative boundaries, land use data, parcels, transit routes, and regional snow routes. Provide GIS products and support for members through user friendly and innovative technologies.

Program Activities (all activities to be conducted by ACOG)

1. Maintain an accurate inventory of transportation planning related geographic data sets using a centralized geodatabase. Develop and apply GIS metadata and other standards.
2. Provide data and maps in multiple formats for requesting entities. Produce maps and data for regional transportation plans and planning efforts.
3. Provide regional coordination and support for GIS data collection and mapping projects.
4. Continue to evaluate the process of integrating county parcel data with land use data.
5. Provide regional coordination for digital aerial sharing and planning. Start planning for 2023 aerial coordination and collection with local members.
6. Explore future GIS and mapping capabilities for ACOG and member entities (e.g., ArcGIS Online, Cloud GIS, etc.).
7. Continue publishing transportation mapping products from ACOG's long-range and short-range programs on ArcGIS Online and provide data to ACOG's members as requested.

End Product

GIS products (data inventories and maps) and aerial photography available for ACOG planning efforts, technical assistance for members, and public access.

Task 1.04: Transportation Planning Assistance - Oklahoma Department of Transportation (ODOT)

Program Objectives

The Oklahoma Department of Transportation (ODOT) will provide administrative, technical, and policy guidance and assistance related to the successful completion of the urban transportation planning work activities itemized in this UPWP.

Program Activities (all activities to be conducted by ODOT)

1. Urban Transportation Planning Process

The Oklahoma Department of Transportation will provide a liaison, maintain information flows, and provide technical assistance for the maintenance of an effective continuous, comprehensive, and cooperative urban transportation planning process in the ACOG MPO area.

2. Computer Support

ODOT's GIS Data Portal and ArcGIS Online systems are available for ACOG to access GIS data collected and maintained by ODOT.

End Product

Urban transportation planning, technical, and computer support and services for the successful implementation of the FY 2023 UPWP.

ELEMENT #2: REGIONAL TRANSPORTATION PLANNING

This activity involves the maintenance and refinement of the long-range and short-range transportation planning processes. Work areas include tasks to develop, maintain, and refine the methodology for reevaluation and update of proposed transportation systems and subsystems. Multimodal travel forecasting models and traffic management strategies will be used in order to improve the system of integrated regional transportation planning. Included is the maintenance of a four-year Transportation Improvement Program (TIP) serving as the short-range implementation tool for the region's long-range, metropolitan transportation plan (MTP).

Tasks Included:

[2.01 - Long-Range Transportation Planning](#)

[2.02 - Short-Range Transportation Planning](#)

[2.03 - System Performance and Congestion Management](#)

[2.04 - Mobility and Public Transportation Planning](#)

[2.05 - Air Quality Planning](#)

Task 2.01: Long-Range Transportation Planning

Background Information

The Infrastructure Investment and Jobs Act (IIJA) (P.L. 117-58, also known as the Bipartisan Infrastructure Law or BIL), was signed into law on November 15, 2021, authorizing federal highway, highway safety, transit, and rail programs for five years from federal fiscal year (FFY) 2022 through 2026. Under the law, Oklahoma is expected to receive approximately \$4.6 billion over five years in Federal highway formula funding for highways and bridges, approximately \$29 million in Section 402 formula funding for highway safety programs, \$349 million in transit improvement funding, and \$66 million to support the expansion of an EV charging network in the state. The law also includes competitive grant programs that could bring additional dollars to the state and region.

In the IIJA, metropolitan and statewide transportation planning processes are extended, including the performance-based planning and programming requirements of MAP-21 and the FAST Act. Requirements for a long-range metropolitan transportation plan (MTP) and a short-term transportation improvement program (TIP) continue and public involvement remains a hallmark of the planning process.

Federal guidelines require a continuing, comprehensive, and coordinated (3C) transportation planning process in metropolitan areas and states. The IIJA retained the MAP-21/FAST Act planning factors that must be considered in the development of metropolitan plans and programs. The IIJA also continued the emphasis on financial feasibility and consideration of social and environmental impacts of transportation decisions.

Encompass 2045, the current long-range plan for the ACOG MPO area, was adopted by the MPO in November 2021. The ACOG MPO area is an air quality attainment area, and therefore the metropolitan transportation plan update for Central Oklahoma is required every five years.

Program Objective

Develop and implement the intermodal long-range transportation plan for the ACOG MPO area in compliance with the requirements of the IIJA. Continue data collection and analysis required for the development of the next long-range plan. Develop and enhance modeling tools in order to accurately estimate and forecast travel patterns.

Program Activities

1. Ensure compliance with guidance issued by the Federal Transit and Federal Highway Administrations that implements the IIJA and any future surface transportation legislation, particularly regarding metropolitan and statewide planning requirements. (ACOG)
2. Evaluate requests to amend the current long-range, Metropolitan Transportation Plan (MTP) in accordance with the ACOG amendment procedures, current surface transportation legislation requirements, financial constraint, public involvement, and any applicable conformity guidelines promulgated under the 1990 Clean Air Act Amendments. Any proposed amendments to the adopted plan shall include consideration of the planning factors, review of mobility benefits and burdens to different socioeconomic groups, the adopted Public Participation Plan (see Task 3.01), regional performance measures, and financial capacity to implement such plan amendments. (ACOG)
3. Finalize 2045 Plan documents and complete 2045 Plan-related reports. (ACOG)
4. Compile and maintain long-range data on roadway, transit, bicycle and pedestrian modes, and on freight movement and airport access within the ACOG MPO area. Evaluate the

projects and recommendations included in the 2045 Plan for improving multimodal and intermodal (transit, bicycle, pedestrian, freight movement) travel and goods movement within the ACOG MPO area. (ACOG)

5. Review and evaluate the process and factors that were considered in the development of Encompass 2045 to begin preparing for the 2050 Plan. Create a development timeline for the 2050 Plan. (ACOG)
6. Monitor and promote the Regional Active Transportation Plan, which evaluates and updates the previous ACOG MPO Bicycle Master Plan and Pedestrian Master Plan. (ACOG)
7. In order to ensure the reliability and responsiveness of forecasting tools, the MPO will continue implementation of a transportation model improvement program (TMIP) to provide for the maintenance of the ACOG MPO model network. ACOG will explore updating the regional travel demand model (TDM), focusing on enhancing the multimodal (transit, bicycle, and pedestrian) component of the existing model. (ACOG)
8. Coordinate with ODOT on possible future plans, including: State Highway-Rail Grade Crossing Action Plan, Statewide Rail Plan, Freight Transportation Plan, Strategic Highway Safety Plan, Active Transportation Plan, and Electric Vehicle Infrastructure Deployment Plan. Share information and assist as needed in processing amendments to the Metropolitan Transportation Plan, the ACOG MPO TIP, and federal functional classification system. Coordinate with ODOT on their statewide transportation modeling effort. (ACOG, ODOT)
9. Coordinate with the Oklahoma Turnpike Authority (OTA) and track and model, as needed, OTA-sponsored improvements to the regional network. (ACOG)
10. Emerging Transportation System Issues (ACOG)
 - a. Monitor advances in transportation system technology, including but not limited to connected and autonomous vehicles (CAVs), on-demand ride services, unmanned aircraft systems, and flexible goods movement. Staff will assist ACOG MPO transportation committees, local governments, COTPA, Norman-Transit, Citylink, state and federal agencies, and the private sector in preparing for local adoption. ACOG will research the impacts CAVs and other technological changes will have on the transportation system and their impacts on social and economic trends including public safety, workforce development, energy use, and air quality.
 - b. Coordinate with regional partners to continue to utilize the 2019 Oklahoma City Metropolitan Area Tree Canopy Study and begin coordinating for an update to the study. Integrate data collected during the study into the metropolitan planning process, including: 2050 Plan and land use scenarios, resiliency efforts, livability and complete streets initiatives, and advanced regional air quality analysis and planning. ACOG will continue to provide member communities with access to the tree survey data to assist in local planning efforts.
 - c. Coordinate with ODOT on development and implementation of potential solutions to long-term transportation system funding gap related to decreasing revenue from fixed excise taxes on motor fuel. Potential solutions identified in ODOT's 2020-2045 Oklahoma Long Range Transportation Plan include: electric vehicle fees, indexing motor fuel taxes to inflation, and VMT fees/Road User Charges (RUC). Coordinate with ODOT on development of a statewide RUC pilot project.

11. Long Range Transit Planning (COTPA)

a. COTPA Long Range Transit Plan Implementation:

- Continue to plan for and/or implement smaller-scale elements of the 2001 COTPA Long Range Transit Plan (LRTP). COTPA included updates to the 2001 COTPA LRTP in the MAPS4 proposition and a timeline for completion will be determined in the summer of 2022.
- COTPA will continue the implementation of the “COTPA Five-Year Board Initiatives” adopted on September 2, 2016.

b. COTPA Regional Fixed Guideway Systems Planning

Continue to advance the recommendations of the 2005 Regional Fixed Guideway Study (FGS), through the following efforts:

- Continue the Northwest Bus Rapid Transit (BRT) Project funded by a federal BUILD grant.
- Support the RTA’s FGS update and Alternatives Analysis.
- Continue to implement the bus rapid transit and enhanced bus element of the 2005 Fixed Guideway Study’s 2030 System Plan, as modified by the findings of the 2013 Nelson Nygaard Transit Services Analysis (TSA) and 2021 Comprehensive Operational Analysis.
- Continue to work closely with the Oklahoma City Planning Department on various transit-related matters and long-term plans.
- Continue to plan for potential streetcar improvement and extensions.
- Continue stakeholder engagement for continued planning and advancement of Fixed Guideway Study recommendations.
- Continue collaborations and public education initiatives for the advancement of transit-oriented development (TOD), supportive land use plans and policies that include the continuum of access to transit services.

c. Northwest BRT and MAPS4

- Continue work on the Northwest BRT and its associated improvements for the launch of revenue service in fall 2023.
- Following the passage of the MAPS4 initiative in 2019, COTPA will begin work on planning for transit projects including bus stop upgrades, microtransit projects, traffic signal prioritization, advanced transit options, service frequency improvements, and future planning in coordination with the MAPS4 Citizens Advisory Committee.

12. Long Range Transit Planning (Norman-Transit)

a. Norman-Transit Long Range Transit Plan Implementation:

- Continue to plan for and/or implement the recommended elements identified in the Go Norman Transit Plan as funds become available.

b. Multimodal Planning:

- Continue to research and/or implement additional modes of transportation that are appropriate for Norman, and which can complement existing public transportation services.

End Product

Technical memoranda and reports documenting program activities, including:

- 2.01 (2) – Summary of MTP Amendments
- 2.01 (4) – Mapped Inventory of Completed MTP Improvements

Task 2.02: Short-Range Transportation Planning

Background Information

Short-range transportation planning plays an important role in identifying and implementing priorities for highway and intermodal improvements within the metropolitan area. The Transportation Improvement Program (TIP) is the primary tool used to advance the goals of the long-range Metropolitan Transportation Plan (MTP).

Program Objectives

Coordinate with ODOT, ACOG MPO area local governments, and local transit providers in the implementation of transportation improvements throughout the region that are consistent with the financially constrained MTP. Expend the region's federal transportation dollars quickly and efficiently in accordance with regionally established priorities.

Program Activities

1. Monitor federally funded transportation improvements within the ACOG MPO area (ACOG)
 - a. Monitor the region's Surface Transportation Block Grant - Urbanized Area (STBG-UZA) funds and provide a mid-year STBG-UZA status report by entity. Aid local entities, as needed, concerning STBG-UZA procedures, funds, project statuses, and obligation of STBG-UZA funds. Ensure projects align with the ACOG Complete Streets Policy. Conduct quarterly status report meetings on active projects with ODOT and relevant local entities.
 - b. Continue to monitor the implementation of ACOG MPO area STBG-Set Aside or Transportation Alternatives Program (TAP) projects, competitively selected using FFY 2013 and FFY 2014 TAP funds and the MPO's project evaluation and scoring criteria. Coordinate with ODOT on the implementation of its 2016 TAP projects. Monitor the FFY 2015 - FFY 2020 TAP (inside the UZA) funding cycle and include coordination with ODOT. Coordinate with ODOT on any future TAP funding and conduct a call for projects in FY 2023.
 - c. Assist ACOG MPO entities in identification of other appropriate federal and state funding sources for local transportation improvements.
 - d. Prepare an annual listing of projects for which federal transportation funds were obligated during FFY 2022, including investments in pedestrian and bicycle facilities.
 - e. Coordinate the distribution of approximately \$8.9 million in (100 percent) funding from the Coronavirus Response and Relief Supplemental Appropriations Act (CRRSAA) of 2021.
2. Monitor and track highway, street, and intermodal (transit, bicycle, pedestrian, freight movement, airport access) improvements by maintaining databases and a GIS inventory of the improvements. Update the annual Network Monitoring Report. (ACOG)

Public transportation providers and other regional transit providers will provide shapefiles and/or other information on route and service changes for inclusion in the region's annual Network Monitoring Report. (COTPA, Norman-Transit)

3. Consider requests by ACOG MPO entities to amend the Federal Functional Classification System as needed. Such requests will be reviewed by the MPO's Technical and Policy Committees and forwarded to ODOT for submission to FHWA. (ACOG)
4. Cooperate with ODOT in the selection of projects for funding on the National Highway System (NHS) and select other Title 23 and transit projects in consultation with ODOT and

area public transportation providers in conformance with TIP and STIP priorities. Coordinate with ODOT on the implementation of ACOG MPO area recommendations from its Strategic Highway Safety Plan (SHSP). (ACOG)

5. Continue working with ODOT and area freight stakeholders to maintain up-to-date inventories of intermodal facilities and goods movement data affecting the ACOG MPO area. (ACOG)

6. Integrated Planning and Environmental Processes

The MPO will provide assistance to lead agencies performing a planning process that can be integrated into the required environmental analysis for major highway and public transit projects in the ACOG MPO area. The analysis process will involve the MPO, ODOT, COTPA, Norman-Transit, FHWA and FTA, and other agencies as needed. The process will establish the range of alternatives to be studied such as alternative modes and general alignments and include appropriate public involvement opportunities. Broad social, economic, and environmental impacts that could result from the proposed improvement will be evaluated. (ACOG, ODOT, COTPA, Norman-Transit)

7. Transition to a new FFY 2024–2027 ACOG MPO Area TIP to include the latest priorities of the MPO member entities. Update the TIP document to reflect continued federal requirements for performance-based planning and programming (See task 2.03). Continue to integrate the goals and objectives of the MTP into the TIP to better connect the long-range and short-range plans. Conduct a call for Surface Transportation Block Grant - Urbanized Area (STBG-UZA) projects and use the STBG-UZA Evaluation Criteria to select projects for inclusion in the TIP. Process amendments to the current TIP through the ACOG MPO Technical and Policy Committees, provide public notice on each amendment, and document said amendments for submission to the FHWA, FTA, ODOT, and other applicable agencies. Monitor revisions to project descriptions, funding sources, and cost estimates in order to maintain a fiscally constrained TIP. Provide input into the ODOT 8-Year Construction Work Plan and Statewide Transportation Improvement Program (STIP).
8. Conduct an update (if needed) of the *Criteria and Process for Evaluation of STBG-UZA Projects*. Revisions will continue to reflect the goals of the Metropolitan Transportation Plan (MTP), the strategies of the Congestion Mitigation Process (CMP), ACOG Complete Streets Policy, and member entity priorities.
9. Short Range Transit Route Performance and Service Plans

- a. Transit Route Performance Evaluation

Utilize on-bus technology and other surveys to monitor route performance, usage trends and validity of service for existing fixed routes. Regularly brief local entities and agencies on system performance as appropriate. (COTPA, Norman-Transit)

- b. Planning for Bus Route Service and Schedules

COTPA will:

- Continued planning for peak service expansion will be ongoing.
- Continue to review the impact of bus route changes and develop bus route service plans in conformance with budgetary considerations and various plans and processes, with special emphasis on the interface with streetcar and BRT.
- Provide advice and technical planning assistance to local communities, as appropriate.

- Provide Edmond Citylink with compliance oversight and transit planning assistance, as appropriate.
- Continue the short-term transit resource improvement planning which has focused on strategies to help COTPA expand its fleet, add CNG fueling, and add electric, and CNG-powered buses, and implement staffing expansions as need to accommodate recent EMBARK service enhancements and hours/days of operation.
- Conduct public engagement activities, as necessary, to plan for and implement a potential addition of more night-routes offering fixed route services until midnight.
- Develop and maintain individual route maps and schedules, and system maps for EMBARK fixed-route services in print and digital formats.
- Begin implementing the 2021 Comprehensive Operational Analysis transit study. The study, called OKC Moves, evaluated existing conditions in Central Oklahoma and explored ways to improve transit service. The preferred alternative includes a prioritized list of changes. It contains implementation plans, cost estimates, facilities requirements, vehicle needs, and staffing needs required for those changes. The changes will integrate local bus service with the NW BRT, extend service to new destinations, improve on-time performance, better connect parts of Oklahoma City, and improve frequency on existing bus routes.

Norman-Transit will:

- Conduct public engagement activities, as necessary, to plan and implement route or service changes.
- Continue to review the impact of bus route changes and develop bus route service plans in conformance with budgetary considerations, various plans (including the Go Norman Transit Plan), and processes. Coordinate with contracted operations to plan, review, and implement changes.
- Plan for fleet replacement and expansion as necessary for service, and to achieve a state of good repair. Apply for grant opportunities to assist with current and future capital needs.
- Develop and maintain individual route maps and schedules, and system maps for fixed-route services in print and digital formats.

c. Streetcar Planning (COTPA)

- Work closely with the OKC Traffic Operations/Engineering group to look at ways to restripe or adjust signals to further enhance the safety and efficiency of the system.
- Monitor streetcar contractor closely to facilitate contract compliance.
- Continue to work with State Safety Oversight (SSO) regarding meeting Public Transportation Agency Safety Plan (PTASP) goals and objectives.
- Continue to track TOD and economic development near streetcar.
- Develop and maintain individual route maps, schedules, and system maps for OKC Streetcar in print and digital formats.

d. On-Call Consultant Planning Services (COTPA)

- COTPA may issue task orders to the consultant for short term plans, USDOT benefit cost analyses (BCA's), grant writing, concept design, Title VI plan updates, and other actions.
- Services can assist COTPA staff, or be turnkey, within an annual budgetary limit.

10. Transit Marketing

COTPA will continue to assess customer experience and community support for transit, as well as conduct marketing to improve ridership. Update previous research to identify potential customers for existing routes.

COTPA will pursue the following strategies to retain and expand ridership, as well as grow community support:

- Establish and implement a multifaceted communications plan to serve existing and potential customers.
- Conduct market research of non-riders to evaluate customer and community perceptions of EMBARK.
- Continue to enhance and develop real-time rider tools for mobile and desktop devices.
- Prepare materials helpful to the public in understanding service changes before they occur.
- Build further brand recognition and service awareness for EMBARK through events, door hangers, social media, digital and TV advertisements, and media relations.
- Conduct market research to learn more about existing customers in order to develop customer profiles and to understand customer expectations, experiences, and needs.
- Develop messages that increase awareness of the environmental effects of single occupancy vehicles (SOV) and how the use of public transportation can help reduce emissions and congestion.
- Continue to engage minority audiences through community events and service programs such as the Haul Pass Program, Roads Scholars, How to Ride classes, the EMBARK Well program, the Arnall Climb program, and other initiatives.
- Continue promotion of rail safety messages aimed at motorists, pedestrians, cyclists, customers, and potential users.
- Develop and implement communication strategies related to the Oklahoma River Cruises, Vanpool, Spokies Bike share, ADA Paratransit, Senior Transportation, Mobility Management programs, and the OKC Streetcar.

Norman-Transit will pursue the following marketing strategies to retain and expand ridership:

- Hold transit promotional events in the community and collaborate with other entities or stakeholders as necessary.
- Use its Limited English Proficiency (LEP) outreach efforts to identify new target groups and promote transit within the LEP populations.
- Continue to enhance and develop real-time rider tools for mobile and desktop devices.
- Prepare public-facing materials to promote understanding of planned service changes prior to implementation of the change.
- Work with contracted operations to promote the Norman transit service to the community and region.

11. Short Range Transit Partnership Planning and Development

- a. Continue public private partnership (P3) efforts to educate about public transit and partner with citizens and other stakeholders to increase ridership. (COTPA, Norman-Transit)
- b. A special effort will continue collaborative groups in the Downtown for TOD near the Santa Fe station and streetcar, as well as along the Northwest BRT corridor. (COTPA)

- c. Continue to identify new funding partners in the region for transit services and amenities, including new transit service and for bus shelters, sidewalks, and trail connections near transit routes. (COTPA, Norman-Transit)

12. Bus Route Accessibility Planning, Sidewalk Survey, and Park & Ride Partners

- a. Continue to work with the OKC, Midwest City, and Norman Planning and Public Works Departments and with other public and private sector partners to identify and address accessibility issues, and plan for and fund additional bus stops, bus shelters, ramps, and sidewalks in certain high-use locations. Monitor ridership patterns and requests for bus stops and add new stops as necessary. (COTPA, Norman-Transit)
- b. Maintain an inventory of bus stop improvements to include ADA accessibility, passenger amenities, signage, and available park-and-ride lots for transit customers. (COTPA, Norman-Transit)
- c. Continue to monitor the private sector deployment of the newly emerging battery-powered scooter technology. Explore the prospect of synergy with transit as a first-last mile option and urge caution as to safety and ADA issues, such as scooter usage on sidewalks. (COTPA, Norman-Transit)

13. Ferry System Planning

- a. Continue to monitor progress on the water-based public transportation system on the Oklahoma River and develop, coordinate, and implement operational and marketing efforts. Operational systems, including schedules, services, and maintenance will be monitored and adjusted to optimize effectiveness and efficiency. Progress will be measured by tracking the number of ferry riders per service hour. (COTPA)
- b. Capital improvement projects, designed to support the system will be planned and monitored by COTPA as part of its oversight of grant funding used for the ferryboat system. COTPA will also monitor river development projects by other entities and seek partnerships for additional landings. Current capital projects include bank stabilization at Exchange Landing, river dredging, and construction of a new landing at the First Americans Museum. These current projects are funded through grants awarded to COTPA and will be monitored for progress. (COTPA)
- c. Vessel refurbishments, as required by the United State Coast Guard, will be scheduled. Work plans for each vessel will be developed to optimize the available federal funds and local contributions. (COTPA)

End Product

Technical memoranda and reports as required, accounting for the findings and analysis of program activities, including:

- 2.02 (1d) – Annual Listing of Federally Funded Transportation Projects Report
- 2.02 (2) – CY 2022 Network Monitoring Report
- 2.02 (7) – FFY 2024-2027 Transportation Improvement Program
- 2.02 (8) – Updated *Criteria and Process for Evaluation of STBG-UZA Projects*

Task 2.03: System Performance and Congestion Management

Background Information

Moving Ahead for Progress in the 21st Century (MAP-21) placed increased emphasis on performance management within the Federal-aid highway and transit programs and required use of performance-based approaches in statewide, metropolitan, and non-metropolitan transportation planning. This priority has been continued under the current surface transportation legislation, the Infrastructure Investment and Jobs Act (IIJA). Performance management is credited with improving project and program delivery, informing investment decision-making, focusing staff on leadership priorities, and providing greater transparency and accountability to the public. The performance-based planning process (PBPP) is intended to assist ACOG MPO area leaders maximize the use of existing transportation facilities, assist with efficient movement of goods, reduce vehicular emissions, and improve air quality, as well as analyze, plan for, and mitigate safety and security related transportation network challenges.

Program Objective

PBPP attempts to ensure that transportation investment decisions are made – both in long-term planning and short-term programming of projects – based on their ability to meet established goals. Activities under this task are designed to pinpoint transportation systems management, travel demand reduction, traffic incident management, safety conscious planning, transportation infrastructure security, and public information opportunities, in addition to other strategies that will improve the overall management and operation of the multimodal transportation network in Central Oklahoma.

Program Activities

1. Performance Based Programming and Management
 - a. Review and assess current and new performance measures, evaluation criteria, data collection, implementation schedule, and the performance measure's relationship to the TIP, long-range Metropolitan Transportation Plan (MTP) and the Congestion Management Process (CMP). (ACOG)
 - b. Set targets for adopted regional performance measures. Targets and reporting requirements will be developed in coordination with ODOT. ODOT will provide updates on their targets to the ACOG MPO Technical and Policy Committees. (ACOG, ODOT)
 - c. COTPA will collaborate with the MPO and, where applicable, the state to achieve the new emphasis area of the FTA in performance management related to public transit agencies Transit Asset Management (TAM) Plan and the Public Transit Agency Safety Plan (PTASP). COTPA will make its safety performance targets available to the State and the MPO to aid in the planning process, and to coordinate with the State and MPO in the selection of the State and MPO safety performance targets. (COTPA)
2. Congestion Management Process
 - a. Examine the MPO's current and planned strategies, as well as additional strategies to alleviate congestion and enhance mobility in accordance with federal rules. (ACOG)
 - b. Implement and evaluate the ACOG MPO Area Congestion Management Process (CMP) and strategies within the MPO's TIP and MTP processes. Update the region's Congested Corridors with the most recent Travel Time Data. Reevaluate and update,

as necessary, the congestion management toolbox as identified in the ACOG MPO Area CMP.

- c. Work with the Oklahoma Department of Transportation, local governments, emergency service providers, public safety units, and others to develop a coordinated long-term congestion management strategy for the region. (ACOG)

3. Traffic Incident Management, Crash Reduction, and Safety Conscious Planning

- a. Continue to collaborate with state and local agencies, as well as non-profits and emergency responders, to further enhance incident management within the ACOG MPO region through involvement in efforts such as region-wide evacuation planning, coordination of regional snow routes and other preventative measures. Explore EV crash solutions and training for public safety personnel. (ACOG)
- b. Continue to provide ACOG with accurate up-to-date crash information to support the regional congestion management process, safety conscious planning, crash analysis, and other MPO initiatives. (ODOT)
- c. Continue ACOG's safety planning efforts in FY 2023. Collect and analyze ACOG MPO area crash data as yearly data is made available by ODOT. Update the ACOG MPO Area Crash Report and monitor high crash corridors for car, bicycle, and pedestrian crashes. Update the online GIS Story Map for the Regional Crash Analysis posted on ACOG's website.
- d. Manage the regional bicycle and pedestrian public safety campaign, Watch for Me OK, in coordination with the Oklahoma Highway Safety Office and other area stakeholders. (ACOG)
- e. Assist in the implementation of the State Highway Safety Plan (SHSP) and provide member entities with ODOT's crash data upon request. (ACOG)

4. Regional Operations Planning and Intelligent Transportation System (ITS) Strategies

- a. Explore the development of a regional ITS Architecture and Deployment Plan in coordination with ODOT, local member entities, and a consultant. Employ the most recent Federal ITS Architecture requirements. Conduct stakeholder meetings, gap needs assessment, Memorandums of Understanding and agreements, and provide stakeholders with potential ITS projects for deployment over 10-year time period and project benefits.
- b. Identify potential impacts, needs and implementation strategies for connected and autonomous vehicles (CAVs). Assess need for infrastructure investments, for example, signage, striping, lighting, and wireless connectivity. Integrate CAV into Universal Design policies. Integrate CAV technology into ACOG MPO ITS architecture.
- c. In coordination with local member traffic management staff, compile and maintain an inventory of intersection traffic control devices, with particular attention to corridors that have synchronized signal systems. (ACOG)
- d. Research, evaluate and distribute information to member entities regarding potential operational and ITS improvements aimed at mitigating transportation issues. (ACOG, ODOT)

- e. Continue to implement ITS strategies including traffic signal prioritization, streetcar estimated arrival times, streetcar tracker, develop new multimodal websites for EMBARK's family of services, and improve mobile fare offering. Staff will evaluate and possibly replace route planning, ridership reporting, and dispatching software. (COTPA)
- f. ITS planning in Oklahoma is guided by three primary goals, which are based on the key transportation needs identified by ITS stakeholders: improve safety and mobility, enhance security, and increase agency efficiency. To achieve the envisioned integrated ITS system, ODOT staff continues to plan and deploy ITS infrastructure (i.e., cameras, dynamic message signs, detectors, weather sensors, and telecommunication, as well as the structural support hardware and cabinets) within the ACOG MPO area. The ITS infrastructure gathers and disseminates essential information to state and local operators, responders, managers, and users of the system. This statewide ITS planning supports the ACOG MPO area ITS Implementation Plan. (ODOT)

5. Regional Construction Coordination

Explore the establishment of a regional construction coordination program that would provide a platform for communication and coordination among the MPO, local governments, and ODOT concerning current and impending ACOG MPO area roadway improvements. The program could be designed to ensure that construction, temporary closures, and detours pose the least burden to the traveling public as possible. (ACOG)

6. Transportation Infrastructure Security

- a. Continue coordination with federal, state, and local homeland security and emergency management related agencies and committees. Participate in relevant meetings and workgroups to represent the interests and the perspective of regionally coordinated transportation. (ACOG)
- b. Analyze the regional transportation network for alternate routes and redundancies to accommodate moving large numbers of people, as well as develop strategies for dealing with choke points, such as toll booths, ramps, etc. (ACOG)

7. Enhanced Planning for Safety and Security Measures

COTPA will:

- COTPA drafted Public Transit Agency Safety Plans (PTASPs) for OKC Streetcar and Bus Operations that meets the new 49 CFR 674 and 673 standards, and continues updating SSEPPs and EAPs accordingly.
- COTPA will continue to address energy security by planning for the addition of a back-up generator to serve the CNG fuel facility.
- The Streetcar operations began in December 2018. The Safety Executive Committee (SEC) and the Safety and Security Operations Committee (SSOC) have been activated. The Fire Life Safety and Security Committee (FLSSC) is a working group under the SSOC that collaborates on tabletop and full-scale exercises, emergency response procedures, and training. OKC Streetcar continues to work closely with the Oklahoma Department of Transportation (ODOT) State Safety Oversight (SSO) staff to ensure our system safety and security compliance.
- COTPA's partnerships with other agencies continue to grow and strengthen. COTPA works closely with the Oklahoma City Police Department (OCPD). OCPD conducts training for bus operations, road supervisors, and bus operators. COTPA continues to work with the Transportation Safety Institute (TSI) by hosting classes at COTPA

facilities, which are also open to the public. The partnership with TSI is advantageous for COTPA employees and operations and aids in strengthening the overall safety system.

- COTPA's partnership with the Transportation Security Administration (TSA) will continue. TSA has completed a baseline assessment for both bus and streetcar. The bus operation participated in TSA's SETA program and the streetcar operation will complete the program next.
- Customer service is one of COTPA's core values and is a major part of our operations. Customer service training is an ongoing process.

Norman-Transit will:

- Monitor and provide oversight to an operations contractor and Norman fleet maintenance to ensure a safe and secure transit system that meets regulations.
- Norman-Transit staff will coordinate with both City of Norman and operations contractor safety staff.
- Continue planning for safety and security features in vehicles, facilities, passenger stations, and bus stops.
- Implement and update, as necessary, the Public Transit Agency Safety Plan (PTASP) that was developed with ODOT to ensure that all federal requirements continue to be met.

End Product

Technical memoranda, reports and publications as required, documenting the findings and analysis of program activities, including:

- 2.03 (1) -Transportation System Performance Report – Performance Measure Targets and Monitoring
- 2.03 (2b) – Updated Regional Congested Corridors Map
- 2.03 (3a) – Regional Snow Routes Map (2022-2023)
- 2.03 (3c) – Regional Crash Report Update and Story Map
- 2.03 (3d) – CY 2022 Watch for Me OK Activities Report
- 2.03 (4) – Regional ITS Architecture and Deployment Plan

Task 2.04: Mobility and Public Transportation Planning

Background Information

Planning for all transit users, older adults, and individuals with disabilities requires the continued identification of transportation needs and the availability of services and resources to meet those needs. Activities under this task include the efficient and coordinated transportation services for seniors and individuals with disabilities, the dissemination of information, and a continued outreach to segments of the community that rely heavily on public transportation for mobility.

Public transportation plays an important role in increasing mobility throughout the region and has gained increasing support in the last decade. Continued support and coordination by ACOG with local transit agencies and other stakeholders will be key to continue elevating public transportation as a viable mode in the region.

Program Objectives

Ensure continued planning and development of transportation services for the elderly and persons with disabilities in Central Oklahoma. Expand paratransit services and implement other components of the Section 504/ADA Implementation Plan to improve accessibility to public transportation by all citizens.

ACOG will continue to provide support, coordination, and technical assistance for the improvement of public transportation services in the region. Public transportation projects will continue to be included in both short-range and long-range planning activities.

Program Activities

1. Vehicles/Organizations Providing Transportation Services to the Elderly and Persons with Disabilities

Coordinate to expend Sec. 5310 Enhanced Mobility of Seniors and Individuals with Disabilities Program funds within the ACOG MPO area in conformance with the metropolitan and Statewide Coordinated Public Transit-Human Services Transportation Plans. (ODOT)

2. Coordinated Public Transit-Human Services Transportation Plan

Projects funded under the Sec. 5310 program will be part of the *Statewide Coordinated Plan* and selected by the Oklahoma Department of Transportation, Office of Mobility. Coordinated Plans will be consistent with the ACOG MPO long-range transportation plan and selected projects will be included in the Transportation Improvement Program (TIP) and Statewide TIP (STIP). (ODOT)

3. Regional Americans with Disabilities Act (ADA) Implementation

- a. Coordination of Mobility Management Services

COTPA will continue the planning and coordination of origin-to-destination services for older adults and people with disabilities. Staff will continue to provide technical assistance to various parties, including local governments, public safety organizations, health care providers, social service organizations, and advocacy groups. (COTPA)

b. Promotion of Mobility Management Services

COTPA will continue promoting services for older adults and individuals with disabilities and providing assistance and coordination of services to other transportation providers. (COTPA)

c. Continue to implement and adjust as necessary the ACOG ADA/504 Compliance Plan. (ACOG)

4. Mobility Management Services Customer Evaluation and Database Management

COTPA will continue to provide eligibility processes for paratransit (both in OKC and Norman) and other mobility management services in both Oklahoma City and Norman. (COTPA)

Norman-Transit will continue to use paratransit scheduling software to track data and assure performance measures are being met. Staff will support the ADA Citizens Advisory Committee, the ADA Staff AdHoc Committee, and any other City, county, or regional boards/commissions that discuss public transit and/or accessibility. (Norman-Transit)

5. Outreach to Elderly and Persons with Disabilities

a. COTPA promotes and measures transit usage by older adults and individuals with disabilities. Demographics are utilized to increase outreach efforts to identify underserved populations and identify target areas with large concentrations of seniors, individuals with disabilities, and other transportation sensitive populations. (COTPA)

COTPA will continue their long-standing partnerships with the Areawide Aging Agency and other entities to encourage awareness of the growing need for senior transportation and to encourage adequate subsidies from within the region. (COTPA)

b. Norman-Transit will work with social service agencies, the elderly, and persons with disabilities to disseminate information about its fixed route and paratransit service. Staff and Norman's operations contractor will provide assistance with trip planning and will encourage use of the fixed route system whenever possible. Staff will work to increase awareness of transportation needs. (Norman-Transit)

6. Public Transportation and Public Relations

Provide public relations and promotion for transit related events. Participate and assist, as needed, with events that promote transit (i.e., Bus to Work Day, Transit Day at the Capitol, EMBARK Third-Friday Free Fare during ozone season, etc.) (ACOG)

7. Transit Route Monitoring, Data, and Mapping

Collect annual route and mapping updates from local transit systems. Maintain transit networks by route by year. Tag each route with days of service. Include streetcar, ferry, and bikeshare operations in inventory of systems. Provide socioeconomic data to transit agencies to assist with transit service planning. (ACOG)

8. Long Range Transit Planning – System Level

a. Coordination and Support of the RTA

- COTPA will provide administrative and planning support for the Regional Transportation Authority (RTA) of Central Oklahoma. As part of this effort, COTPA will assist the RTA with the completion of the transit system plan for the region, including the vision, goals, and potential corridors; initiation of an alternatives analysis for corridors identified in the system plan including corridor planning, station, land use, and concept development, and start environmental review, preliminary engineering, and application for FTA funds. (COTPA)

COTPA will also serve as staff liaison to the Oklahoma City RTA Board Members and work with the RTA in various areas to support improved transit in ACOG MPO area. (COTPA)

- The City of Norman will serve as staff liaison to the Norman RTA Board Member and will work with the RTA in various areas to support improved transit in the ACOG MPO area. (Norman-Transit)
- As the MPO, ACOG will aid in the regional coordination between the Regional Transportation Authority (RTA) of Central Oklahoma, local governments, local transit agencies, and ODOT. (ACOG)

9. Long Range Transit Planning – Project Level

ACOG will provide assistance and support for the joint COTPA/Oklahoma City Bus Rapid Transit (BRT) project on NW Expressway and N. Classen Blvd. (ACOG)

10. Public Transportation Coordination

- ACOG, COTPA, Norman-Transit, Citylink, Oklahoma City Planning Department, and ODOT will convene quarterly coordination meetings. This forum enables transit providers, subrecipients of transit funding, and other transportation professionals to interface about transit services, changes, and issues in the region. Highlights of each meeting will be presented at ACOGACOG MPO Technical Committee meetings. (ACOG, COTPA, Norman-Transit, ODOT)
- Continue to coordinate with local public transportation providers to include transit projects in the Metropolitan Transportation Plan (MTP) and the Transportation Improvement Program (TIP). (ACOG)

(Livability Initiatives section was moved to Task 2.05: Air Quality Planning)

End Product

Technical memoranda and reports as required, documenting the findings and analysis of program activities, including:

- 2.04 (10) – FY 2022 Quarterly Public Transportation Coordination Meetings Report

Task 2.05: Air Quality Planning

Background Information

Although the ACOG MPO area is in compliance with federal air quality standards, regional leaders continue to explore strategies that will maintain and improve the region's air quality. ACOG works in concert with multiple stakeholders on air quality related activities with a particular focus on ground-level Ozone.

Ozone

On December 23, 2020, EPA completed its review of the full body of currently available scientific evidence and exposure/risk information and decided to retain the existing ozone National Ambient Air Quality Standards (NAAQS). Since 2015, the primary and secondary ozone standard levels are to 0.070 ppm parts per million (ppm). In December 2017, all of Oklahoma's 77 counties were designated attainment/ unclassifiable for the revised primary and secondary ozone standards. Central Oklahoma's ozone regional value was 0.070 ppm at the end of 2021.

Central Oklahoma remains in attainment, yet the region must continue to be proactive in promoting activities and programs that protect and improve its air quality.

Program Objective

Assist the ACOG MPO transportation committees, local governments, COTPA, Norman-Transit, state and federal agencies, and the private sector in maintaining compliance with NAAQS. Utilize various techniques to reduce air pollution and decrease congestion.

Program Activities

1. Air Quality Data Analysis:

- a. Monitor and evaluate air quality issues related to transportation. Organize and attend Regional Air Quality Stakeholder Committee meetings as scheduled. Receive and review the monthly ozone and particulate matter readings and related meteorological data monitored daily by ODEQ's Air Quality Division. Attend quarterly meetings with statewide MPOs, ODOT and ODEQ to discuss next steps and potential impact of the revised ozone standard. (ACOG, ODOT)
- b. Work with EPA and ODEQ to implement new ozone and particulate matter standards and assess the implications of these standards on the Central Oklahoma region. Work with ODEQ on updating and implementing the State Implementation Plan (SIP) and Infrastructure State Implementation Plans (I-SIPs) for ozone and particulate matter. Determine the conformity of air quality and transportation plans for the ACOG MPO area. (ACOG)

2. Ozone Alert Day Program:

Coordinate with ODEQ, ODOT, COTPA, Norman-Transit, and other regional transit providers in the implementation of Ozone Alert Days when high levels ground-level ozone are predicted. Document highest recorded pollutant levels on alert days, along with information on the monitoring station location and magnitude of the event. Explore partnerships with public health organizations. Coordinate with ODOT to alert people via dynamic message signs to carpool or use public transit on Ozone Alert Days. (ACOG)

3. Air Quality Public Education

- a. Continue the Air Quality Public Education Program, initiated in FY 2001, to promote personal actions intended to reduce mobile and non-mobile emissions, particularly on days which are conducive to high ozone levels. Activities such as carpooling, refueling vehicles at night, use of public transportation, bike-and-bus strategies, and trip chaining that attempt to smooth out the peaks on high ozone days will be the focus of this educational effort. It is expected that Congestion Mitigation Air Quality (CMAQ) funds will be used to finance some of these public awareness efforts. (ACOG, ODOT, COTPA, Norman-Transit)
- b. COTPA and Norman-Transit will document passengers traveling with bicycles on buses daily and work to increase awareness and encourage combining bike and bus trips as an effort to improve air quality. (COTPA, Norman-Transit)
- c. Promote and help support regional activities and events such as Bike Month, Bike to Work Day, National Drive Electric Week, Open Streets, Sciencefest, and Earth Day. (ACOG)
- d. Develop new partnerships with large employers and multifamily housing developments in support of fixed route, vanpool, on-line trip planning, and other transit programs. (COTPA)

4. Air Quality Small Grant Program

Continue to administer the Air Quality Small Grant Program, which funds small active transportation infrastructure and congestion reduction techniques in an effort to improve regional air quality. The program awards are made available to eligible applicants through a competitive grant process using available CMAQ funds. A variety of projects and programs will continue to be eligible, but all serve to achieve long-term reductions in transportation-related emissions that contribute to the formation of ground-level ozone. ACOG and grant recipients will continue to monitor funded projects after completion, in order to determine project effectiveness. (ACOG)

5. Air Quality Planning and Ozone Advance

- a. Coordinate with the Oklahoma Department of Environmental Quality (ODEQ), in the implementation of the Ozone Advance Program. The program encourages expeditious emission reductions of NO_x and VOC's (ozone precursors) and fine particle (PM_{2.5}) attainment areas to help these areas continue to meet the National Ambient Air Quality Standards (NAAQS). ACOG works in collaboration with ODEQ to submit annual ozone and PM_{2.5} emissions reduction project updates to EPA.
- b. Develop a regional air quality plan. The purpose of the plan is to set goals and strategies for new and expanded emissions reductions efforts to keep the region in attainment of the NAAQS. (ACOG)
- c. Provide technical assistance to ACOG MPO members developing sustainability planning documents, climate action plans, or similar planning projects (ACOG)

6. Promotion of Alternative Fuels – Central Oklahoma Clean Cities Program

- a. Provide data for, and coordinate with, ACOG's Clean Cities program. Clean Cities program efforts focus on promoting the use of alternative fuels (as defined by Congress and the U.S. Department of Energy, alternative fuel vehicles, idle reduction technologies, hybrid electric and other advanced technology vehicles, as well as fuel efficient vehicles in the ACOG MPO area through a government-industry partnership that includes federal, state and local government leaders and officials, industry/business leaders, health and environmental professionals, and civic leaders.

Alternative fuels are considered cleaner fuels than conventional petroleum-based fuels, thereby reducing vehicle emissions and improving air quality. Clean Cities staff will provide technical and marketing assistance and coordination for the stakeholder committee to expand the use of alternative fuels across the ACOG MPO area. (ACOG)

- b. Provide information to fleet stakeholders on vehicle and fueling infrastructure funding opportunities including but not limited to: FTA Low or No Emission Vehicle Program - 5339(c), EPA Diesel Emissions Reduction Act (DERA) Funding, and Oklahoma Department of Environmental Quality (DEQ) Volkswagen Settlement Funding. (ACOG)
- c. Coordinate and administer the Oklahoma Electric Vehicle Coalition (OEVC) as part of the Central Oklahoma Clean Cities program. The coalition's objectives are to support and facilitate the education and adoption of electric vehicles (EV) and electric vehicle supply equipment (EVSE) in the state of Oklahoma through outreach and infrastructure development. (ACOG)
- d. The region's transit providers will continue to use and explore opportunities to expand alternative fuel technology and evaluate the advantages and disadvantages of alternative fuel sources in Central Oklahoma's transit fleets. (COTPA, Norman-Transit)

7. Public Fleet Conversion Grant Program

Continue implementing and administering the Public Fleet Conversion program which allows government entities and school districts to access federal funds for projects that promote the conversion of vehicles to alternative fuel vehicles (AFVs), the purchase of original equipment manufactured AFVs, the purchase of advanced vehicle technologies, idle reduction technologies, and the development of the AFV refueling and recharging infrastructure within the ACOG MPO area. (ACOG)

8. Regional Rideshare Program

Expand EMBARK vanpool program to add more vanpools by working with ACOG, employers, workforce development entities, and other stakeholders to educate commuters and promote this transit option. Tinker Air Force Base is launching a vanpool program in partnership with EMBARK. (COTPA)

9. Livability Initiatives

Coordinate with public health and various other entities and community organizations to promote livability principles, complete streets, healthy communities, sustainability, Open Streets, walkability, and transit-oriented development (TOD). (ACOG)

Continue past initiatives to further livability as related to both streetcar and bus planning. COTPA will continue to place greater emphasis on transit-oriented development (TOD). COTPA will coordinate with public health, bicycle, car sharing, public housing, and various other entities and community organizations to promote livability principles, healthy communities, sustainability, brownfields reuse, walkability, health fairs, and transit. (COTPA)

10. Planning for Alternative Transportation

COTPA:

Progress of the Bike Share Program will be monitored and measured by the number of trips per month and the number of trips per bike.

Planning for the introduction of e-bikes will continue. Planning for marketing and maintenance activities will also continue. Data collected from the dockless bikes and e-bikes will be analyzed to assess the viability of the mode and their impact on the system.

Monitoring of the e-scooter system will continue as staff continues to evaluate these for expansion at bus shelters outside the urban core.

Norman-Transit:

As the City of Norman continues to evaluate and seek funding for a bike share program, transit will collaborate with other City staff to ensure that the two transportation options complement each other.

Continue monitoring e-scooter operations and how that mode provides transportation access in Norman and first/last mile connections to transit.

ACOG:

Create a regional amenity guide to aid local communities and organization select and install amenities for area trails, parks, and streetscapes.

End Product

Documentation of Air Quality Planning related activities. Public information and educational materials related to the air quality benefits of alternative forms of transportation and fuels.

Technical memoranda, publications, and reports as required, documenting the findings and analysis of program activities, including:

- 2.05 (3c) – CY 2022 Bike Month Activities Report
- 2.05 (3c) – CY 2022 Open Streets Activities Report
- 2.05 (4) – FY 2022 Air Quality Small Grant Program Status Report
- 2.05 (5a) – EPA Ozone Advance Program – Oklahoma City Update
- 2.05 (5b) – Regional Air Quality Plan
- 2.05 (6) – Transportation Technology Deployment Report: Central Oklahoma Clean Cities
- 2.05 (7) – FY 2022 Public Fleet Conversion Grant Program Status Report
- 2.04 (10) – Regional Amenity Guide

ELEMENT #3: PUBLIC PARTICIPATION

Consistent with citizen participation guidelines from the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), this element includes work tasks required to ensure effective public information and public involvement in the transportation planning process. The MPO establishes methods for encouraging citizens, affected organizations, and other interested parties to be involved in the development of the three major areas of the ACOG MPO planning process: the long-range transportation plan, the transportation improvement program, and the ongoing transportation planning program.

The MPO conducts numerous informational activities during each program year to keep citizens informed on various aspects of the regional transportation planning process. ACOG also disseminates information to the public via social media outlets.

Task Included:

[3.01 – Public Information, Outreach, and Participation](#)

Task 3.01: Public Information, Outreach, and Participation

Background Information

Citizen participation is an integral part of the ACOG MPO planning process. Increased communication among residents, elected officials, and technical staff permits everyone to work more easily together to achieve desired goals. When the public is involved in the planning process, issues often can be addressed early enough to reduce the time and cost of project implementation.

ACOG uses several public outreach techniques to communicate with the general public about the regional transportation planning process, including public meetings, news releases, reports and publications, surveys, electronic newsletters, email blasts, the ACOG website, and ACOG Facebook, Twitter, Instagram, and blog posts.

Program Objective

Assure ample opportunities for residents, including those with disabilities, affected public agencies, and representatives of all modes, to participate in the regional transportation planning process through informational meetings and work sessions. Solicit input from traditionally underrepresented populations. Serve as a source of public information for transportation planning programs by preparing and disseminating general and specific transportation information to other public agencies, professional and business interest groups, community-based organizations, and the public at large. Provide a location for receipt of suggestions and feedback regarding the long-range transportation plan, the transportation improvement program, and specific projects.

Program Activities

1. Meet with local city councils, study groups, residents' groups, or civic organizations to receive input and to inform the public about the various tasks in the Unified Planning Work Program. (ACOG)
2. Maintain a database for contacting various individuals and interest groups about the regional transportation planning process in Central Oklahoma, including civic, modal, tribal, environmental, minority, neighborhood, and other resident groups. (ACOG)
3. Explore options to engage public involvement in the metropolitan transportation planning process. If deemed appropriate, convene meetings of the Encompass 2045 Stakeholder Advisory Group (SAG) to receive input for updates to Encompass 2045. Evaluate the public involvement activities from Encompass 2045 and ACOG's transportation planning process and research additional public involvement strategies for future plans and programs. (ACOG)
4. Coordinate with tribal governments and encourage their involvement in the transportation planning process. (ACOG, ODOT, FHWA)
5. Continue to identify and utilize appropriate tools to communicate with low income, minority, LEP, and other traditionally under-represented groups in accordance with Title VI of the 1964 Civil Rights Act and Environmental Justice regulations. Provide appropriate accommodations, as requested by individuals with disabilities, so they can access and participate in regular and special meetings. (ACOG, ODOT, COTPA, Norman-Transit)
6. Prepare public notices for proposed updates and amendments to the ACOG MPO Transportation Improvement Program and Metropolitan Transportation Plan. Notices of proposed TIP amendments will be published at least 10 days prior to the anticipated date of decision by the ACOG MPO Policy Committee, and notices of proposed Plan amendments will be published at least 30 days prior to the anticipated date of the ACOG

MPO Policy Committee meeting. The ACOG MPO Policy Committee will conduct a public hearing prior to its decisions. (ACOG)

Review transportation plans annually, including the Transportation Improvement Program (TIP) and make changes based upon the ACOG MPO Technical Committee recommendations. COTPA and Norman-Transit will rely on the MPO's public notice of participation activities and time established for public review of the TIP as the primary way to satisfy Section 5307 public involvement requirements for the Program of Projects (POP). The MPO (ACOG) TIP notices will reflect this arrangement and practice. (ACOG, COTPA, Norman-Transit)

7. Continue to implement and adjust as necessary the ACOG Public Participation Plan (PPP). Comments related to the transportation planning process and products will be documented and provided to the ACOG MPO Policy Committee to assist them in their decision making. (ACOG)
8. Prepare press releases, ACOG website data, blog posts, brochures, or other special publications explaining services available to local governments, aspects of regional planning and other general information. Special materials may also be prepared on issues such as air quality, congestion management, Intelligent Transportation Systems (ITS) planning, corridor preservation, Census results, connected and autonomous vehicles, alternative fuels, and other topics identified at the request of the Policy Committee. Materials will be prepared in languages other than English when appropriate and in accordance with ACOG's Limited English Proficiency (LEP) Plan. (ACOG)
9. Utilize the ACOG website to provide information about the region's long-range metropolitan transportation plan and short-range transportation improvement program, including the plan summary, plan report, map of planned street and highway network improvements, and amendments to the TIP and long-range plan. (ACOG)
10. Maintain the electronic Transportation Improvement Program system (e-TIP) with a public interface for greater agency transparency for federally funded TIP and MTP projects, as well as a public comment section to encourage feedback. (ACOG)
11. Participate in public outreach events, including but not limited to: Bike to Work Day, Open Streets, GIS Day, Earth Day, and Bus to Work Day.

End Product

A record of public forums and meetings will be maintained. The newsletters will be distributed, along with other brochures, publications, and press releases, as needed. Notices will be published in the local newspaper(s) regarding proposed amendments to the regional transportation plan and Transportation Improvement Program (TIP).

Technical memoranda and reports documenting program activities, including:

- 3.01 (8) – FY 2022 Public Outreach Activities

ELEMENT #4: TRANSPORTATION PLANNING ASSISTANCE AND COORDINATION

This element includes overseeing the effective operation of the organization through committee meetings, regular review of organizational structure and principles, certification requirements, and development and refinement of the Unified Planning Work Program (UPWP), local technical assistance projects, and other tasks.

Tasks Included:

[4.01 - Program Coordination and Certification Process](#)

[4.02 - Local Technical Assistance Projects](#)

Task 4.01: Program Coordination and Certification Process

Background Information

A major function of ACOG is general program coordination encompassing specific tasks concerned with the continued operation of the ACOG MPO Metropolitan Planning Organization (MPO). The specific tasks included ensure effective operation and provide forums to address local transportation issues and to establish policy. ACOG also provides for grants management, technical assistance, and continued certification of ACOG MPO by FHWA and FTA for receiving federal capital and planning assistance under federal and state statutes. Similarly, transit providers undergo a review by FTA to ensure compliance with federal regulations and guidelines.

Efforts are also undertaken to monitor and review the current work program and develop a comprehensive program for the following year.

Program Objective

Ensure that the transportation planning process is conducted in compliance with federal laws and guidance established by the Federal Highway and Federal Transit Administrations, state laws, and local statutes. Prepare documents necessary for the administration of the continuing planning process.

Program Activities

1. Provide for the administration of ACOG MPO, its committees and subcommittees, and consultation with local officials participating in the ACOG MPO planning process. Provide necessary preparation for meetings and conduct all work necessary for holding these meetings and follow-up thereafter. (ACOG)
2. Provide for the financial administration of ACOG MPO planning grants and programs, including preparation of planning grant applications and management of the UPWP budget and any necessary revisions. (ACOG)
3. Monitor the FY 2023 UPWP and revise or amend, if needed. Develop the FY 2024 UPWP to include task descriptions and budget. Summarize FY 2023 accomplishments for the FY 2024 UPWP.
 - a. Explore implementing recommendations from the 2020 MPO quadrennial recertification review by FHWA and FTA. (ACOG)
4. Prepare annual joint certification statement for FY 2023. Develop the statement in cooperation with ODOT and COTPA to document the MPO's effectiveness in fulfilling federal requirements regarding the 3C transportation planning process. (ACOG)
5. Convene quarterly meetings to facilitate discussion and coordination between ODOT, FHWA, ACOG, and other MPOs. (ODOT)
6. Continue administration and enforcement of drug-free workplace policies and programs. COTPA will continue to work with Edmond Citylink transit to ensure their testing program is compliant with FTA standards and that the annual MIS report is submitted in a timely manner. Successfully address in training and through communications the impact of the legalization of medical marijuana and safety sensitive employees. (ACOG, COTPA, Norman-Transit)

7. Document program compliance for various tasks, including but not limited to air quality, Environmental Justice, equal employment opportunity, periodic self-evaluation, and other legislation and regulations, as necessary. (ACOG, COTPA, Norman-Transit)
 - a. COTPA will be working diligently to recruit employees that are representative of our diverse community.
 - b. COTPA will continue statistical monitoring of employee training and development. In addition, COTPA continues to expand training offerings to mid-level management and to all employees and will ensure anti-discriminatory trainings and AA/EEO Program guidelines are being utilized in training, promotion and hiring.
 - c. Continue to implement and adjust as necessary Title VI Plans. (ACOG, COTPA, Norman-Transit)
 - d. Continue to implement and adjust as necessary Limited English Proficiency (LEP) Plans. (ACOG, COTPA, Norman-Transit)
 - e. Continue implementing Disadvantaged Business Enterprises (DBE) Program Plans and prepare a set of new DBE participation goals. (COTPA, Norman-Transit)
 - f. Continue to monitor sub-recipient and contractor compliance. (ACOG, COTPA, Norman-Transit)
 - g. Transit Asset Management (TAM)
 - a. Norman-Transit will continue to work with ODOT as necessary to update the state group TAM plan and submit documents to FTA or ACOG as needed. (Norman-Transit)
 - b. Continue to implement and adjust TAM plan as necessary. (COTPA)
 - h. COTPA and Norman-Transit will begin preparing for the next FTA Triennial Review that will likely occur in FY 2023. Staff will send documents and meet with FTA review staff as requested. (COTPA, Norman-Transit)
 - i. Continue to conduct procurements with federal funds in a manner complying with federal guidance. Examples of potential procurements include fleet replacement, fleet expansion, technology infrastructure, software, maintenance needs, and projects supporting safety and security. (ACOG, COTPA, Norman-Transit)

End Product

Administrative and policy memoranda, reports and relevant documents as required for each activity, including:

- 4.01 (3) - FY 2024 Unified Planning Work Program

Task 4.02: Local Technical Assistance Projects

Background Information

During the fiscal year, staff responds to numerous requests for assistance from member local governments, state agencies, private organizations, and citizens. Many of these requests relate to the ACOG MPO planning process, covering topics such as federal programs and funds established by the IIJA, project review, socioeconomic data, traffic counts, etc.

In the past, staff has also provided assistance to member entities for projects of a slightly larger scale than regular technical assistance requests.

Program Objective

Provide information and technical services to member entities in an effort to assist them in the areas of planning and facility management. As studies are completed, technical capabilities and refined databases are developed, allowing for increased utilization of these services and information. The objective is to assist member entities in the application of existing data and analytical capabilities for solving specific local problems. Staff will respond to requests by member entities for assistance in preserving or improving existing community areas and ensuring orderly growth and development.

Program Activities

1. Provide information and transportation planning technical assistance upon request to assist local governments and sponsor agencies with acquiring socioeconomic, environmental, traffic, and land use data. Technical assistance and data support will be provided to COTPA, Norman-Transit, and Citylink for use in transit planning activities. (ACOG)
2. Monitor transportation related policy development as discussed in the Federal Register, Oklahoma Register, and the U.S. Department of Transportation website. Staff will also provide assistance in educating and informing local, state, and federal units of government regarding highway, bicycle and pedestrian, and transit related issues and priorities. (ACOG)
3. Continue to update, format, and catalog a set of standard regional information reports and databases to facilitate a timely response to requests. (ACOG)
4. Tabulate and analyze the technical assistance provided to local governments and others concerning the ACOG MPO transportation program. (ACOG)

End Product

An ongoing resource to provide service to sponsor agencies and local units of government. Measurement of this activity is conducted by each staff member who records all technical assistance.

ELEMENT #5: STAFF TRAINING AND MAINTENANCE AND PRODUCTION OF PLANNING RELATED DOCUMENTS

This element includes a task on providing adequate staff training to ensure that current, high-quality planning and research techniques are used in the Central Oklahoma transportation planning process. This element also includes work items to develop, maintain, and update all regional planning documents including technical reports, funding procedures, and other plan reports. These work items include the publication and re-publication of current planning documents to ensure the general availability of this information to interested persons and public officials.

Tasks Included:

[5.01 - Staff Training](#)

[5.02 - Planning Documents, Reports, and Data Dissemination](#)

Task 5.01: Staff Training

Background Information

Staff members from ACOG, OKC Traffic Management, COTPA, and Norman-Transit attend various workshops, courses, seminars, and conferences to keep up with the state-of-the-art techniques in transportation planning. Additionally, they learn about new federal policies and emphasis areas toward transportation in general.

Program Objective

Provide adequate staff training to ensure that current, high-quality planning and research techniques are used in the ACOG MPO Transportation Management Area.

Program Activities

(Activities under this task will be completed by ACOG, COTPA, Norman-Transit, and OKC Traffic Management on an as needed basis)

1. Attend transportation planning courses, training sessions, seminars, conferences, and webinars in order to maintain and enhance technical capacity of staff. Training sessions will include but not be limited to traffic data collection and analysis, transportation planning, traffic engineering and transportation systems management, FTA grants management, transit software, transit operations, improved transportation service to persons with disabilities, air quality emissions modeling, performance management, public involvement and modeling and analysis software.
2. Attend professional development workshops, courses, seminars, webinars, and conferences and other such meetings related to transportation planning, transit security and grant programs.
3. Review transportation related literature and publications by staff to help keep up with state-of-the-art techniques.

End Product

- Technical training for staff.

Task 5.02: Planning Documents, Reports, and Data Dissemination

Background Information

Technical documents with information describing study, databases, methodology and results are produced for distribution to various committee members and other agencies connected with the transportation program.

Program Objective

Maintain a technical record of the transportation data gathering, data analysis, and planning procedures for future work consistency and time series review.

Program Activities

ACOG, OKC Traffic Management, COTPA, and Norman-Transit are responsible for preparation of their own reports. Progress reports are due quarterly to ACOG.

1. Document procedures, methods, and testing used for the transportation planning process in technical work papers or reports.
2. Document work by task activity for progress reports.
3. Continue to improve formats, standards, and metadata for maps, data, and reports. Promote data exchange, particularly in the areas of GIS data and computer-generated maps.

End Product

- Technical reports describing work accomplished for a specific UPWP subtask which are submitted to the ACOG MPO Technical Committee and ACOG MPO Policy Committee for their review and comment before finalization.
- Maps related to all or part of the ACOG MPO area.
- Progress reports.

ELEMENT #6: MANAGEMENT

This work item provides for the effective administration of the continuing planning process. Included under this item is the supervision and coordination of personnel assigned to the study and office management.

Task Included:

[6.01 - Direct Project Management](#)

Task 6.01: Direct Project Management

Background Information

This task provides for the management and support of ACOG MPO planning, research, and technical assistance activities. This includes responsibility for accounting, budgeting, and personnel management.

Program Objective

Provide for the effective administration of the ACOG MPO. Manage grants and contracts with ODOT, OKC Traffic Management, consultants, and other entities and agencies. Support the various transportation related committees; manage the ACOG MPO transportation planning staff; and maintain liaison with the affected public and private interests.

Program Activities

1. Supervise personnel assigned to the ACOG MPO planning work. Monitor work on the UPWP and evaluate progress. (ACOG)
2. Prepare and maintain adequate records of correspondence, purchasing, grant applications, annual audit, and contracts. (ACOG)
3. Prepare progress reports to include accounting reports for ODOT, FHWA, and FTA. (ACOG)
4. Review federal policies and procedures as they relate to the 3-C urban transportation planning process. Analyze the IIJA for its effect on the current planning process and recommend modifications as needed. (ACOG)

End Product

A U.S. Department of Transportation certified transportation planning process.

ATTACHMENT 1: MEMORANDUM OF UNDERSTANDING

BETWEEN THE ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS,
OKLAHOMA DEPARTMENT OF TRANSPORTATION,
CENTRAL OKLAHOMA TRANSPORTATION AND PARKING AUTHORITY, AND
CITY OF NORMAN, OKLAHOMA

WHEREAS, Section 134(a) of Title 23, and Section 5303 of Subtitle III of Title 49, U.S.C. require that federally funded projects be developed through a comprehensive, cooperative, and continuing transportation planning process; and

WHEREAS, the Association of Central Oklahoma Governments (ACOG) has been designated as the Metropolitan Planning Organization (MPO) for the Oklahoma City Metropolitan Area; and

WHEREAS, ACOG, the Oklahoma Department of Transportation (ODOT), the Central Oklahoma Transportation and Parking Authority (COTPA), and the City of Norman, Oklahoma (NORMAN) desire to maintain a comprehensive, cooperative, and continuing planning process for the ACOG MPO Area that results in the development of transportation goals and objectives, long and short-range transportation plans, and programs of implementation.

NOW, THEREFORE, ACOG, ODOT, COTPA and NORMAN enter into this agreement to carry out the comprehensive, cooperative, and continuing planning process for the ACOG MPO area as detailed below:

1. *ACOG MPO Policy Committee*

Responsibility for policy direction, plan selection and development of programs for plan implementation is vested in an ACOG MPO Policy Committee. The Policy Committee shall transmit all transportation policies, plans, and implementation programs to ACOG, the MPO, for review and endorsement.

The ACOG MPO PC membership is as follows:

- A. A designated elected official* from each of the transportation study area political subdivisions** listed below:

Bethany	Del City	Lexington	Newcastle	Piedmont
Blanchard	Edmond	Logan County	Nichols Hills	Purcell
Canadian County	Forest Park	Luther	Nicoma Park	Slaughterville
Cedar Valley	Goldsby	McClain County	Noble	Spencer
Choctaw	Guthrie	Midwest City	Norman	Tuttle
Cleveland County	Harrah	Moore	Oklahoma City	The Village
Cole	Jones	Mustang	Oklahoma County	Warr Acres
				Yukon

* Each elected official shall be permitted to designate an alternate from his governing body to participate in his absence.

** Each additional political subdivision added to the transportation study area shall be permitted to designate a voting elected official to the committee.

- B. A designated trustee of the Oklahoma City Airport Trust or their designee.
- C. A designated trustee of the Central Oklahoma Transportation and Parking Authority or their designee.
- D. The City Manager of the City of Norman, Oklahoma or their designee.
- E. The Oklahoma Transportation Commissioner from Districts 3, 4, and 7 or their designees.
- F. The Division Engineer of the Oklahoma Department of Transportation Strategic Asset and Performance Management or their designee.
- G. The Division Manager of the Oklahoma Department of Transportation Multi-Modal Division or their designee.
- H. A non-voting representative from each of the following: Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), and Federal Transit Administration (FTA).

The Policy Committee shall meet regularly to perform the following duties:

- A. Review recommendations of the ACOG MPO Technical Committee and set policies for transportation planning.
- B. Direct development and adopt regional transportation plans and the Transportation Improvement Program (TIP); review transportation plans at least annually; and make changes based upon recommendations of the Technical Committee. In regard to the TIP, COTPA and NORMAN will rely on the MPO's public notice of participation activities and time established for public review of the TIP as the primary way to satisfy Section 5307 public involvement requirements for the Program of Projects (POP). The ACOG MPO TIP notices will continue to reflect this arrangement and practice.
- C. Recommend any changes in plans to the Planning Commission or City Councils of participating agencies and recommend methods of financing any changes.
- D. Elect a chairperson and hold meetings on a regular basis.
- E. Vote on business items before the Policy Committee provided a quorum of twelve (12) of the designated members is present. The ACOG staff has the primary administrative responsibility for maintaining the regional transportation plans and supporting documents necessary to serve the Policy Committee.
- F. Receive comments and observations from representatives of each federal agency in the United States Department of Transportation - Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), and Federal Transit Administration (FTA) - who will be requested to attend the Policy Committee meetings. From time to time, the different agency representatives will be asked to clarify new rules, regulations, or procedures affecting the Policy Committee decision process.

2. ACOG MPO Technical Committee

The technical advice and guidance for transportation planning is vested in the ACOG MPO Technical Committee. The Technical Committee consists of technical and professional personnel from the various participating agencies. This Committee reviews the technical aspects of the study and makes recommendations to the Policy Committee.

The Technical Committee membership is as follows:

Voting:

- A. Oklahoma Department of Transportation (ODOT) - Strategic Asset and Performance Management Division Engineer or designee.
- B. Oklahoma Department of Transportation (ODOT) - Multi-Modal Division Manager or designee.
- C. Local Government - Two official staff members from each of the member local governments, one designated as City or County Planner and one designated as City or County Engineer. In the absence of a staff member who is an engineer or planner, the Chief Executive Officer may serve; no consulting engineer or planner may serve on the committee.
- D. Association of Central Oklahoma Governments (ACOG) - Executive Director or designee.
- E. Central Oklahoma Transportation and Parking Authority (COTPA) - Administrator and one (1) delegate or designee.
- F. City of Norman, Oklahoma (NORMAN) - City Manager and one (1) delegate or designee.
- G. Oklahoma City Department of Airports - Director and one (1) delegate or designee.
- H. Oklahoma Aeronautics Commission - Director or designee.
- I. Oklahoma Department of Environmental Quality (ODEQ) - Director or designee.

Non-Voting:

- J. Areawide Aging Agency (AAA) - Executive Director or designee.
- K. Capitol-Medical Zoning Commission - Director or designee.
- L. Oklahoma Department of Transportation (ODOT) - Local Government Division Engineer or designee.
- M. Oklahoma Railroad Association - Director or designee.
- N. Oklahoma Turnpike Authority (OTA) - Chief Engineer or designee.
- O. Oklahoma Trucking Association - Director or designee.
- P. Tinker Air Force Base - Deputy Base Civil Engineer or Base Comprehensive Planner or designee.

- Q. Tribal Governments – Representatives in the ACOG MPO area or their designees.
- R. Federal Bureau of Indian Affairs (BIA) – Delegate or designee.
- S. U.S. Department of Transportation - FHWA, FTA and FAA delegates or designees.

The ACOG MPO Technical Committee may appoint other qualified individuals to full voting membership in order to utilize their professional expertise and to coordinate the transportation planning process activities with other planning areas such as airports, parking, bicycling, etc.

The Chairman of the Technical Committee shall be the ACOG Executive Director or his designee. Meetings shall be held on a regular basis to review technical procedures and advise the ACOG MPO Policy Committee. A quorum of the ACOG MPO Technical Committee shall consist of one-third of the most current appointments from designated voting membership including representatives from at least four member cities or counties; however, business conducted in the absence of a quorum shall be forwarded to the ITPC in the same manner as business conducted with a quorum, except the number of cities and counties represented shall be noted (in the minutes and in the transmittal to the ITPC) along with the statement that a quorum was not present.

3. Unified Planning Work Program (UPWP)

Detailed planning activities will be developed each year in a Unified Planning Work Program (UPWP) with the ACOG MPO Technical Committee and adopted by the ACOG MPO Policy Committee. ACOG, ODOT, COTPA and NORMAN agree to participate in the development of the UPWP each year so that it reflects a cooperative annual planning process. The UPWP will specify the annual work activities with the responsible agency, participating agency costs, and funding sources.

This Memorandum of Understanding has been approved through formal resolution or action of the Association of Central Oklahoma Governments, the Oklahoma Department of Transportation, the Central Oklahoma Transportation and Parking Authority, and the City of Norman, Oklahoma on or before the 7th day of July 2020.

5-28-2020
Date


Association of Central Oklahoma Governments
Matt Dukes, Chairman

7/07/2020
Date


Oklahoma Department of Transportation
Dawn Sullivan, Deputy Director

6-5-20
Date


Central Oklahoma Transportation and Parking Authority
Chris Kauffman, Chairman

5-18-20
Date


City of Norman, Oklahoma
Darrel Pyle, City Manager

ATTACHMENT 2: ACOG MPO TECHNICAL COMMITTEE BYLAWS

ARTICLE I.	GENERAL
ARTICLE II.	PURPOSE
ARTICLE III.	STRUCTURE AND MEMBERSHIP
ARTICLE IV.	MEETINGS
ARTICLE V.	FUNCTION AND ROLE OF THE ITTC
ARTICLE VI.	GENERAL TRANSPORTATION ADVISORY ROLE
ARTICLE VII.	SEVERABILITY CLAUSE

ARTICLE I. GENERAL

- Section 1. **Name.** The technical advisory committee, as established by the Memorandum of Understanding, Section II, shall be known as the ACOG MPO Technical Committee.
- Section 2. **Effective Date.** These bylaws shall be effective immediately upon adoption by the ACOG MPO Policy Committee.
- Section 3. **Amendments to Bylaws.** These bylaws may be amended by a majority vote of the Policy Committee on their own motion. The Technical Committee may recommend amendments of the bylaws to the Policy Committee.

ARTICLE II. PURPOSE

- Section 1. **Purposes of the ACOG MPO Technical Committee.** The purposes of the Technical Committee shall include:
- a. To serve in an advisory capacity to the ACOG MPO Policy Committee in all technical matters concerning and related to transportation.
 - b. To represent the regional intermodal transportation system interest in implementing these purposes and acting as the technical advisory committee.
 - c. To generate public interest in, and attention to, improvement of the intermodal transportation system of the transportation study area, and to coordinate with other transportation planning groups.
 - d. To assist the Policy Committee in providing planning and coordination with the local governments, Oklahoma Department of Transportation (ODOT), Federal Highway Administration (FHWA), Federal Aviation Administration (FAA), and Federal Transit Administration (FTA).
 - e. To respond to specific requests from the Policy Committee.

ARTICLE III. STRUCTURE AND MEMBERSHIP

Section 1. **Representation.** The Technical Committee membership shall be as follows:

Voting:

- a. Oklahoma Department of Transportation – Strategic Asset & Performance Management Division Manager or designee.
- b. Oklahoma Department of Transportation – Multi-Modal Division Manager or designee.
- c. Local Government - Two official staff members from each of the member local governments, one designated as City or County Planner and one designated as City or County Engineer. In the absence of a staff member who is an engineer or planner, the Chief Executive Officer may serve; no consulting engineer or planner may serve on the committee.
- d. Association of Central Oklahoma Governments (ACOG) - Executive Director or designee.
- e. Central Oklahoma Transportation and Parking Authority (COTPA) - Administrator and one (1) delegate or designee.
- f. City of Norman, Oklahoma (NORMAN) – City Manager and one (1) delegate or designee.
- g. Oklahoma City Department of Airports - Director and one (1) delegate or designee.
- h. Oklahoma Aeronautics Commission - Director or designee.
- i. Oklahoma Department of Environmental Quality - Director or designee.

Non-Voting:

- j. Areawide Aging Agency - Executive Director or designee.
- k. Capitol-Medical Zoning Commission - Director or designee.
- l. Oklahoma Department of Transportation – Local Government Division Engineer or designee.
- m. Oklahoma Railroad Association - Director or designee.
- n. Oklahoma Turnpike Authority - Chief Engineer or designee.
- o. Oklahoma Trucking Association - Director or designee.
- p. Tinker Air Force Base - Deputy Base Civil Engineer or Base Comprehensive Planner or designee.
- q. Tribal Governments - Representatives in the ACOG MPO area or their designees.
- r. Federal Bureau of Indian Affairs (BIA) - Delegate or designee.
- s. U.S. Department of Transportation - Federal Highway Administration (FHWA), Federal Transit Administration (FTA) and Federal Aviation Administration (FAA) delegates or designees.

The technical advisory committee may appoint other qualified individuals to full voting membership in order to utilize their professional expertise and to coordinate the transportation planning process activities with other planning areas such as airports, parking, bicycling, etc.

The Technical Committee Chair shall be notified in writing of the appointment, reappointment or replacement of a member agency representative's member.

- Section 2. **Alternate Members.** Alternate representatives may be designated to act on behalf of voting and non-voting members with all the privileges accorded thereto provided the alternate is an official staff member of the member agency. The Technical Committee Chair shall be notified in writing of the appointment, reappointment or replacement of a member agency representative's alternate. An alternate may vote only in the absence of the regular member he or she represents.
- Section 3. **Proxies.** Each member shall have the power to appoint a proxy who is not already a member or alternate of the Technical Committee to act in the member's capacity at any meeting in the event the member or alternate cannot attend, if the proxy designation is made:
- a. In writing for a specific period of time, or
 - b. By telephone or personal contact with the ACOG Executive Director or designee for one meeting.
- A designated proxy, as provided in this section, shall have the right to exercise one vote in all individual proceedings and shall not be permitted to exercise one or more proxies on behalf of other members or alternates.
- Section 4. **Terms.** Voting members shall be designated for appointment for an indefinite term by the governing body or chief executive of their agency and may serve as long as qualified under Section 1 above.
- Section 5. **Vacancies.** In the event of a vacancy on the Technical Committee, said vacancy shall be filled according to the procedures of Article III, Section 4 above.
- Section 6. **Membership Attendance.** Any member, alternate or his/her designated proxy who has not attended three (3) consecutive regular monthly meetings may be contacted by the ACOG staff to discuss attendance at subsequent meetings either by the member, alternate or proxy.
- If the member, alternate or proxy fails to attend a subsequent meeting, this may be reported to the appropriate Policy Committee member or Chief Executive making such designation for appointment.
- Section 7. **Members' Obligation.** The members of the Technical Committee are charged with the duty to conduct themselves as representatives of the transportation system as a whole with the purpose of improving intermodal transportation in the transportation planning area.
- Section 8. **Chairman.** The Chairman of the Technical Committee shall be the ACOG Executive Director or his/her designee.

- Section 9. **Subcommittees.** The Technical Committee shall have the power to create subcommittees of a temporary or permanent nature.
- Section 10. **Subcommittee Membership.** Appointment of members to the Technical Committee subcommittees shall be by the Chairman. Chairman of the various subcommittees shall be appointed by the Chairman of the Technical Committee. Subcommittee chairmen must be members of the Technical Committee.

ARTICLE IV. MEETINGS

- Section 1. **Meeting Time.** The regular monthly meeting date and time of the Technical Committee shall be established by the Technical Committee with concurrence by the Policy Committee. The schedule of meetings shall be posted according to state law.
- Section 2. **Meeting Notice; Minutes.** The ACOG Transportation Planning Services staff will send out a meeting notice to all members one week in advance of the meeting. Staff will include all agenda items for discussion at the meeting in the meeting notice. Agenda items for regularly scheduled monthly meetings shall be submitted to the ACOG staff no later than two weeks before each meeting. Addendums to the agenda shall be prepared in accordance with the requirements of the Oklahoma Open Meeting Act. Minutes shall be prepared by ACOG staff for each meeting and subcommittee meeting. Such minutes shall accurately reflect the conduct of the meeting, all activities and relevant discussion occurring at the meeting, and a record of all votes taken. Tape recordings of all meetings shall be preserved at least 12 months from the date of the meeting and be available for review by any interested party.
- Section 3. **Quorum.** A quorum of the ACOG MPO Technical Committee shall consist of one-third of the most current appointments from designated voting membership including representatives from at least four member cities or counties; however, business conducted in the absence of a quorum shall be forwarded to the Policy Committee in the same manner as business conducted with a quorum, except the number of cities and counties represented shall be noted (in the minutes and in the transmittal to the Policy Committee) along with the statement that a quorum was not present.
- Section 4. **Open Meetings.** All meetings of the Technical Committee shall be conducted with no restrictions on the attendance of observers, citizens or the press, and shall comply with all requirements of the Oklahoma Open Meeting Act.
- Section 5. **Voting.** All voting members, as specified in Article III, Section 1, their alternates or proxies shall have the right to exercise one vote per designated representative. For entities that have two representatives, both representatives are eligible to vote if they are present.
- a. Non-voting members shall retain the right to advisory comments on all proceedings, which shall be recorded and reflected in all minutes and reports to the Policy Committee.
 - b. Voting on all proceedings of the Technical Committee shall be based on the majority of those regular members, alternates or proxies present and voting, not a majority of total membership.
 - c. No entity shall make and second its own motion.

ARTICLE V. FUNCTION AND ROLE OF THE TECHNICAL COMMITTEE

Section 1. **Function.** The function of the Technical Committee shall be:

- a. To act as an advisory committee to the Policy Committee and provide for the Policy Committee technical review, recommendations and information.
- b. To serve as a committee which reviews and recommends to the Policy Committee annually, a draft Unified Planning Work Program (UPWP) prepared by the ACOG staff in cooperation with participating entities. This shall include review and recommendation of the scope, content, and work products of the UPWP; this shall also include an oversight function during the progress of the year.
- c. To serve as a committee which reviews and recommends to the Policy Committee a draft Transportation Improvement Program (TIP), plans, and policy statements prepared in cooperation with the ACOG staff.
- d. To act as a technical resource to review and comment on the procedures used during the performance of work elements and during preparation of reports.
- e. To review the federal aid allocation procedures and methodology and present recommendations to the Policy Committee as required.

ARTICLE VI. GENERAL TRANSPORTATION ADVISORY ROLE

Section 1. **Advisory Function.** The Technical Committee may, upon its own motion, bring important matters relative to transportation to the attention of the Policy Committee. Such advice and/or recommendations may be accompanied by a request from the Technical Committee for formal Policy Committee action.

ARTICLE VII. SEVERABILITY CLAUSE

Section 1. **Severability.** If any section, subsection, sentence, clause, phrase or portion of these bylaws is for any reason held invalid by the Policy Committee, said portion shall be deemed a separate, distinct and independent provision, and such holding shall not affect the validity of the remaining portions of these bylaws.

Bylaws amended and approved by the
ACOG MPO Policy Committee: May 28, 2020

Administrative Changes: June 14, 2022

ATTACHMENT 3: CERTIFICATION STATEMENT ACOG MPO TRANSPORTATION MANAGEMENT AREA FY 2022

A JOINT CERTIFICATION STATEMENT FOR THE ACOG MPO TRANSPORTATION MANAGEMENT AREA BY THE OKLAHOMA DEPARTMENT OF TRANSPORTATION AND THE ASSOCIATION OF CENTRAL OKLAHOMA GOVERNMENTS

1. A Memorandum of Understanding (MOU), signed in FY 2020, among the Oklahoma Department of Transportation (ODOT), the Central Oklahoma Transportation and Parking Authority (COTPA), City of Norman Transit and the Association of Central Oklahoma Governments (ACOG) provides the organizational structure and basis for the Comprehensive, Continuing and Cooperative (3C) transportation planning process, also known as the ACOG MPO for the Transportation Management Area (TMA).
2. ACOG Metropolitan Planning Organization (MPO) provides the support necessary to ensure that the 3C transportation planning process in the ACOG MPO Transportation Management Area is current and ongoing, and is being conducted in accordance with Section 134 of Title 23, U.S.C. and Section 5303 of Title 49, U.S.C.
3. The 2045 Metropolitan Transportation Plan (MTP), known as Encompass 2045, was adopted by the ACOG MPO Policy Committee and endorsed by the ACOG Board of Directors on November 18, 2021. The fiscally constrained Plan contains street and highway, public transportation, bicycle, pedestrian, and goods movement components and recommendations.
4. The ACOG MPO area Congestion Management Process (CMP) was adopted by the Policy Committee in August 2016. The CMP includes an assessment of the Central Oklahoma CMP network, quantitative congestion indicators, and related performance measures for ongoing analysis, and various strategies to alleviate congestion at a regional level.
5. The ACOG MPO Transportation Improvement Program (TIP) is the short-range planning tool that identifies federally funded projects consistent with the goals of Encompass 2045. In FY 2019, ODOT, the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Oklahoma MPOs approved the updated the *Procedures for Developing the Oklahoma Metropolitan Planning Organization (MPO) Transportation Improvement Program (TIP) and the Oklahoma Statewide Transportation Improvement Program (STIP)*. To comply with the updated procedures, a new TIP is prepared biennially and provided to the Oklahoma Department of Transportation for approval (as the governor's designee) and inclusion in the STIP.
6. The MPO completed an upgrade to the regional transportation model to include a mode choice component that would meet FTA requirements in FY 2011.

7. Public involvement in the transportation planning process is accomplished in accordance with 23 CFR 450.316(a). The *Public Participation Plan* (PPP) was updated by the MPO in September 2020. The PPP provides for public outreach activities associated with development and amendment of the MTP, development and amendment of the ACOG MPO TIP, and on-going public involvement efforts associated with the transportation planning process.
8. COTPA provides transit service and paratransit service in full compliance with the Americans with Disabilities Act (ADA) and all FTA requirements in the Oklahoma City (OKC) metro. COTPA provides paratransit service citywide in OKC beyond FTA requirements outside the $\frac{3}{4}$ mile Zone One radius. Zone Two service extends an additional $\frac{3}{4}$ mile and Zone Three extends to the remainder of Oklahoma City limits. The City of Norman provides fixed route and paratransit service in full compliance with the ADA and all FTA requirements in the City of Norman as operated by COTPA. The City of Norman's Zone One for paratransit service covers the FTA required area within $\frac{3}{4}$ mile of all fixed route service, while The City of Norman's Zone Two covers the remaining area within the city limits. Citylink in Edmond provides transit service and paratransit service within $\frac{3}{4}$ mile of fixed routes.
9. The 2030 Systems Plan, a product of the 2005 Regional Fixed Guideway Study (FGS), established the vision for a regional public transportation system within the ACOG MPO area. Subsequently, COTPA conducted an alternatives analysis for a downtown OKC circulator. COTPA and the City of Oklahoma City completed construction of the Oklahoma City streetcar using local funds from a temporary penny sales tax called MAPS3. The service launched in December 2018. COTPA is also in the engineering phase of the NW Bus Rapid Transit project, another recommendation from the FGS. It's anticipated to launch in the 4th quarter of 2023.
10. Technical reports, prepared by ACOG planning staff, have been submitted to the Intermodal Transportation Technical and Policy Committees, and to FHWA and FTA for review.
11. The Unified Planning Work Program (UPWP) is prepared cooperatively with the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the ACOG MPO entities, ODOT, ACOG, COTPA and City of Norman Transit.
12. The FY 2022 UPWP was approved by the Policy Committee and endorsed by the ACOG Board of Directors on June 24, 2021. Tasks accomplished under this UPWP include completion of the 2045 Metropolitan Transportation Plan (MTP), including finalizing projects lists and financial components, drafting of plan documentation, and public outreach efforts; implementation of the Encompass 2045 projects and strategies, upon approval of the MTP; preparation for the 2050 MTP development process; update of the regional travel demand model (TDM); implementation of the Active Transportation Plan; update of the FFY 2022-2025 TIP and continue coordination with local governments regarding federal transportation funding opportunities; update of the regional Intelligent Transportation Systems (ITS) Architecture and Deployment Plan in coordination with ODOT; continuation of the bicycle and pedestrian public safety campaign in coordination with Oklahoma City

and other member local governments; completion of the Cost of Nonattainment Study documentation; air quality planning and compliance with the federal transportation law; and monitor emerging transportation system issues and technologies.

13. The FY 2023 UPWP was approved by the Policy Committee and endorsed by the ACOG Board of Directors on **June 30, 2022**. This UPWP contains tasks related to the development of the 2050 MTP base data; update of the regional travel demand model (TDM); implementation of the ACOG MPO Active Transportation Plan; development of the FFY 2024-2027 ACOG MPO TIP and continue coordination with local governments regarding federal transportation funding opportunities. Other priorities include the update of the regional Intelligent Transportation Systems (ITS) Architecture and Deployment Plan in coordination with ODOT; continuation of the bicycle and pedestrian public safety campaign in coordination member local governments; update of the Congestion Management Process and associated toolbox; development of a regional air quality plan; review of MPO public outreach strategies; air quality planning and compliance with the federal transportation law; and monitor emerging transportation system issues and technologies. The FY 2023 UPWP was accepted by FHWA and FTA by letter dated **, 2022**, which authorized the MPO to proceed with the work under the FY 2023 UPWP effective July 1, 2022.
14. Memorandums of Understanding (MOUs), signed in FY 2018, between ACOG and ODOT, and between ACOG and public transit providers to ensure compliance with 23 CFR 450.314(h) by establishing a cooperative process for developing transportation performance targets for the Oklahoma City TMA.
15. In FY 2019, the MPO established targets for the federally required safety, system performance, and pavement and bridge condition performance measures with coordination from ODOT, OHSO, and FHWA, in accordance with 23 CFR 490.209(c). The MPO continues to establish annual safety targets. In CY 2022, the MPO reviewed the progress made towards reaching the selected targets.
16. The ACOG MPO area worked with the Oklahoma Division of the FHWA and ODOT regarding the implementation of non-federal match credit for FHWA PL funds. On August 21, 2020, the FHWA finalized *Non-Federal Match for FHWA PL Funds, Oklahoma Procedures*, and transmitted the same to ACOG. These procedures enable the state and MPOs to take credit for eligible planning activities that are paid for with non-federal funds. The procedures are based on provisions of 49 CFR 18.24 (a)(2).
17. The FY 2023 UPWP contains tasks encouraging participation of private enterprise in planning activities. Private providers of transportation services are represented on the Technical Committee and the Stakeholder Advisory Group (SAG) and are invited to participate in the development of the TIP and other planning activities.
18. The FFY 2022-2025 TIP reflects a financially constrained, prioritized list of improvements consistent with Encompass 2045 and identifies how these investment priorities will help achieve regional performance targets, in accordance with 23 CFR 450.326. Projects that will utilize Surface Transportation Block Grant - Urbanized Area (STBG-UZA) funds were selected and approved by the MPO

based on the *Criteria and Process for Evaluation of Surface Transportation Block Grant - Urbanized Area (STBG-UZA) Projects*. In conformance with current surface transportation legislation, TIP project cost estimates include an inflation factor to reflect year of expenditure dollars.

19. In FY 2022, the MPO prepared an Annual Listing of Obligated Projects report documenting the federal transportation funds authorized by FHWA and FTA within the ACOG MPO area during FFY 2021. Projects that include bicycle and pedestrian improvements are highlighted in the report.
20. The Census 2010 Urbanized Area (UZA) boundaries were announced on March 27, 2012. Although physically joined, the Census Bureau maintained separate Oklahoma City and Norman UZAs. In FY 2013, in cooperation with ODOT, the MPO developed a 2010 Adjusted Urban Area Boundary (UAB) encompassing the two UZAs. Under the Infrastructure Investment and Jobs Act (IIJA), it is anticipated that the populations of both UZAs will continue to be combined for highway funding purposes.
21. The 2010 Federal Functional Classification Plan for the Oklahoma City Urban Area was approved by FHWA on August 5, 2014, and used to direct the expenditure of federal funds within the ACOG MPO area during FFY 2022.
22. ACOG's Title VI Assurance, LEP Assessment and ADA Plan remain in effect, and all Title VI and ADA documents and forms are available on ACOG's website. The Central Oklahoma Transportation and Parking Authority (COTPA) and City of Norman Transit prepare Title VI reports documenting that transit services and amenities are provided according to FTA regulations in circular 4702.1B.
23. Activities related to the Presidential Order on Environmental Justice are included in the ACOG MPO metropolitan transportation plan. The MPO's general mailing list, media contacts, and Stakeholder Advisory Group (SAG) provide communication to a diverse population including minority populations, low-income populations, environmental advocates, neighborhood associations and special districts, the traditionally underserved, public transportation providers, and transportation mode groups. The Metropolitan Transportation Plan, Encompass 2045, is summarized in a double-sided flyer that is available on the ACOG website and distributed at various locations and events as appropriate. A notice was created in English, Spanish, Vietnamese, and Chinese that states that translated documents are available upon request. The Encompass 2045 plan summary was posted on the ACOG website in all four previously stated languages and the plan summary flyer was translated into Spanish.
24. The participants of the 3C planning process comply with Section 1101(b) of the IIJA, which requires that a percentage of federal funds made available to direct recipients be spent with disadvantaged business enterprises (DBEs).
25. The MPO continued administration of its comprehensive air quality public education program, Air Quality Small Grant Program, and Public Fleet Conversion Program, using CMAQ funding.

26. The MPO continued to work with the Oklahoma Department of Environmental Quality on the implementation of EPA's Ozone Advance Program. The program encourages expeditious emission reductions in ozone and fine particulate (PM_{2.5}) attainment areas to help these areas continue to meet the National Ambient Air Quality Standards (NAAQS).
27. All air quality planning in the region is conducted as an integral part of the regional transportation planning process using the same data and techniques. The Oklahoma Department of Environmental Quality, with the cooperation of ACOG, has been responsible for the locally prepared transportation portion of the State Implementation Plan (SIP).
28. In accordance with FTA emphasis areas, an alcohol and drug abuse policy is included in the ACOG Personnel Policies. The Drug-Free Workplace Act Certification Statement was submitted to FTA on June 28, 1990.
29. Representatives of FHWA and FTA conducted the eighth joint evaluation of the ACOG MPO area transportation planning process October 27-29, 2020. In FY 2021, FHWA and FTA issued their final report jointly certifying that the ACOG MPO transportation planning process substantially meets the requirements of 23 CFR Part 450.336.

Based on the enumerations mentioned above, the Oklahoma Department of Transportation and the Association of Central Oklahoma Governments declare that the ACOG MPO is an effective ongoing 3C transportation planning process and is in compliance with all applicable laws and regulations. Consequently, the ACOG MPO has been recertified for FY 2022.

Signed this _____ day of _____, 2022

Association of Central Oklahoma Governments
ACOG MPO Chair

Signed this _____ day of _____, 2022

Oklahoma Department of Transportation
Director of Capital Programs

ATTACHMENT 4: RELATED CORRESPONDENCE

SUBJECT:

**PREPARATION FOR FY 2023 UNIFIED PLANNING WORK PROGRAM (UPWP) -
SUBCOMMITTEE SCHEDULE REMINDER**

DATE:

FEBRUARY 24, 2022

FROM:

JENNIFER SEBESTA

Transportation Planning Services (TPS) Manager

INFORMATION:

Each year ACOG, in conjunction with its member entities, prepares the annual Unified Planning Work Program (UPWP). The UPWP is a description of the proposed multimodal transportation planning activities to be conducted in the ACOG MPO area for a given fiscal year.

The attached meeting schedule is for the preparation of the FY 2023 UPWP. This schedule provides for meetings of the UPWP Subcommittee consisting of staff from: the Association of Central Oklahoma Governments (ACOG), the Central Oklahoma Transportation and Parking Authority (COTPA), the Federal Highway Administration (FHWA), the Oklahoma Department of Transportation (ODOT), Oklahoma City Traffic Engineering, City of Norman, and any other member entity or agency interested in providing their input into the process.

ACTION REQUESTED:

For information only.

Preparation for FY 2023 UPWP - Subcommittee Schedule

1. February 25, 2022
Friday
UPWP Subcommittee Meeting at 10:00 a.m.
Assessment of FY 2022 UPWP
2. March 9, 2022
Wednesday
UPWP Participants provide draft information to ACOG. COTPA, Oklahoma City Traffic Engineering, City of Norman, and ACOG staff to provide draft task descriptions and proposed budgets for FY 2023 UPWP to ACOG.
3. March 11, 2022
Friday
UPWP Subcommittee Meeting at 10:00 a.m.
Discussion of Draft FY 2023 UPWP
4. March 18, 2022
Friday
UPWP Subcommittee Meeting at 10:00 a.m. **if needed**
Refine task descriptions and budget. Review and finalize preliminary draft to be submitted to ACOG MPO TC and ACOG MPO PC
5. April 7, 2022
Thursday
ACOG MPO TC Agenda mail out
6. April 14, 2022
Thursday
ACOG MPO TC action/recommendation on Preliminary FY 2023 UPWP
7. April 28, 2022
Thursday
ACOG MPO PC and ACOG Board requested to approve Preliminary UPWP, including granting approval to execute contracts and agreements. Submittal of Preliminary FY 2023 UPWP to ODOT, FHWA and FTA as recommended by ACOG MPO PC
8. May 12, 2022
Thursday
ACOG MPO TC recommends approval of the final FY 2023 UPWP to the ACOG MPO PC
9. May 26, 2022
Thursday
ACOG MPO PC and ACOG Board requested to approve final FY 2023 UPWP

**JOINT MEMORANDUM OF AGREEMENT (MOA)
BETWEEN THE OFFICES OF THE
FEDERAL HIGHWAY ADMINISTRATION (FHWA)
AND THE
FEDERAL TRANSIT ADMINISTRATION (FTA)
FOR ADMINISTRATION OF TRANSPORTATION
PLANNING AND PROGRAMMING IN THE
FTA REGION SIX AREA**

Our Region has a long history of cooperation between FHWA and FTA staffs in the delivery of the two agencies' programs. This agreement for the coordination of program matters is an example of the agencies' cooperative efforts. The agreement, originally executed in 1991, prior to the passage of Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), has undergone several revisions in response to our customers' need for more streamlined Federal actions on the Unified Planning Work Program (UPWP), Transportation Improvement Program (TIP), Statewide Transportation Improvement Program (STIP), Metropolitan and Statewide Planning Findings, Certification of the Transportation Planning Process, Congestion Management Systems (CMS) and Intelligent Transportation Systems (ITS), Air Quality Conformity Findings, and Corridor Studies/Alternatives Analysis. This agreement is intended to strengthen the already strong working relationship of the two agencies in their efforts to fulfill the mutual responsibility for transportation planning and the programming of Federal funds. It is also meant to achieve maximum staff efficiencies through the elimination of duplicative reviews and actions thereby improving the quality of assistance to our customer's expectations, and improving our delivery of oversight responsibilities insofar as timeliness and consistency.

The FTA and the FHWA mutually agree to the following procedures for transportation planning activities in the FTA Region 6 areas (Arkansas, Louisiana, New Mexico, Oklahoma and Texas). Additionally, all parties agree to the tracking of performance measures as outlined in attachment A.

A. Review and Approval of Unified Planning Work Programs (UPWP)

Background

Section 134 of 23 U. S. C. establishes Federal requirements for metropolitan transportation planning. The regulations for implementing these provisions are contained in 23 C.F.R 450 and 49 C.F.R. 613 and include the requirement for submission of the UPWP.

Procedures

All UPWPs will be submitted by the State DOT to the FHWA Division Office and FTA Regional Office. Review, reconciliation of comments and action on the UPWPs will be accomplished within 30 days of receipt by FHWA and FTA.

Except for West Memphis, all Transportation Management Area (TMA) UPWPs will be concurrently reviewed by the FHWA Division and the FTA Regional Offices. The FHWA Division and FTA Regional staffs shall meet or teleconference as necessary to discuss and resolve any comments relevant to providing a joint response. The FHWA Division will prepare the draft letter and transmit it to the FTA Regional Office. The approval will be issued as a joint FTA Region/FHWA Division letter. The signatories may be as delegated for approval of the UPWP.

The FHWA Division will act as the Executive Agent for FTA for the review and approval of the UPWPs for all non-TMAs and for the West Memphis, Arkansas TMA. The FHWA Division shall consult with the FTA Region on unusual or potentially controversial transit related studies. The FTA Regional staff will advise the FHWA Division of any concerns within two weeks of receipt of the UPWP. The FHWA Division will provide the FTA Region with a copy of all UPWP approvals and correspondence. Any revisions to the UPWPs will be handled in a similar manner.

B. Approval of Statewide Transportation Improvement Programs (STIP)

Background

Section 135 of Title 23 U.S.C. establishes Federal requirements for statewide transportation planning. The regulations, 23 C.F.R 450 and 49 C.F.R 613, require that at least every two years the State will submit their proposed STIP to the FHWA and the FTA for joint approval prior to the obligation of Federal funds made available to the State under Title 23 and the Federal Transit Act. These regulations also require that the State include with their proposed STIP a certification that the transportation planning process is being carried out in accordance with the requirements listed in the regulations.

Procedures (STIP)

The State will submit their proposed STIP to the FHWA Division Office and FTA Regional Office for review and approval. The STIP shall be reviewed for compliance with the requirements of Section 135 and the regulations in 23 C.F.R 450. This joint review shall include, but not be limited to, the requirements on air quality conformity, public involvement, fiscal constraint, inclusion of all Title 23 and Federal Transit Act funded projects including metropolitan and Federal Lands TIPs, and the acceptability of the State's certification that the transportation planning process is being carried out in accordance with all applicable requirements of §450.220(a).

The FHWA Division and the FTA Regional Office shall meet or teleconference as necessary to discuss and resolve any comments relevant to providing a joint approval of the State's STIP. This joint review effort will be documented in the form of a "Joint Record of Review" compiled by the FHWA Division Office and processed as outlined in the section of this agreement pertaining to TIP Federal findings. This "Joint Record of Review" shall form the official record

documenting the FHWA/FTA joint review efforts on the STIP. The FTA Regional Administrator and the FHWA Division Administrator (or their designee), will take joint action as described by 23 C.F.R 450.220 based on the comments listed in the "Joint Record of Review." A draft action letter will be prepared by the FHWA Division Office and sent to the FTA Regional Office for coordination. Notification of the action taken for the STIP will be forwarded to the State by the FHWA Division Administrator. Initial STIP comments will be prepared by U.S. DOT within 30 days of receiving the STIP. Final action by U.S. DOT on the STIP will be within 60 days after receiving the STIP from the State assuming initial comments have been addressed.

(STIP Amendments)

Depending on the nature of the proposed STIP Amendment, the STIP Amendment may be acted upon jointly by FHWA and FTA in a manner similar to that described above, or it may be acted upon unilaterally by either FHWA or FTA. If the amendment is for highway projects only, then FHWA will take unilateral action. If the amendment is for transit projects only, then FTA will take unilateral action. For unilateral actions, the State DOT will submit the STIP amendment only to the appropriate Federal agency for action.

C. Federal transportation planning finding for TIPs

Background

23 C.F.R 450.320 requires a joint Federal finding that the TIP for each metropolitan planning area is the product of a continuing, comprehensive transportation planning process carried on cooperatively by the State, Metropolitan Planning Organization (MPO), and transit operator, in accordance with 23 U.S.C. 134 and 49 U.S.C. 5303 of the Federal Transit Act. The finding shall be based on the self-certification by the State and the MPO under 23 C.F.R 450.334 and upon other reviews as deemed necessary by FHWA and FTA.

Procedures

For each metropolitan planning area, the FHWA Division Office and the FTA Regional Office will review the status of the transportation planning process prior to approval of the STIP. The review shall include, but not be limited to, the State/MPO self-certification required by 23 C.F.R 450.334(a), the existence of an approved transportation plan that appropriately addresses the planning factors, the adequacy of the public involvement process, the reasonableness of the financial plan, relationship of projects in the TIP to long range transportation plan, air quality conformity of transportation plans and TIP, and satisfaction of the Congestion Management System (CMS) requirements in carbon monoxide (CO) and ozone non-attainment TMAs.

In a TMA designated as non-attainment for CO and/or ozone, the CMS shall provide an appropriate analysis of all reasonable (including multimodal) travel demand reduction and operational management strategies for the corridor in which a project that will result in a significant increase in capacity for single occupancy vehicles (adding general purpose lanes to an existing highway or constructing a new highway) is proposed.

The FHWA Division Office and the FTA Regional Office will evaluate each metropolitan planning process based on previous reviews, attendance at meetings, review of the UPWP, discussions, etc. A Joint Record of Review will be prepared by the FHWA Division Office. The FHWA Division Office will sign the Joint Record of Review and forward the document to FTA.

The FTA will concur, concur with additional comments, or advise the FHWA Division Office of any significant concerns. The FHWA Division and FTA Regional Offices shall meet or teleconference as necessary to discuss and resolve any significant concerns relevant to the joint finding. The FTA will sign the Joint Record of Review and return the document to the FHWA Division Office for distribution. This Joint Record of Review shall form the official record documenting the joint review efforts on the transportation planning process necessary for the FHWA/FTA finding that the TIPs contained in the STIP for the State are based on a continuing, comprehensive, transportation planning process carried on cooperatively by the States, MPOs, and transit operators, in accordance with the provisions of 23 U.S.C. 134 and 49 U.S.C. 5303 of the Federal Transit Act.

D. Air Quality conformity reviews and conformity determinations for Metropolitan Transportation Plans (MTPs) and Transportation Improvement Programs (TIPs) in metropolitan planning areas designated non-attainment or maintenance under the Clean Air Act.

Background

Section 176(c) of the Clean Air Act established conformity requirements for metropolitan transportation plans, TIPs, and projects in areas designated as non-attainment or maintenance. Section 176(d) of the Clean Air Act established priority requirements for programs supported by the Federal Government in order to provide for timely implementation of eligible portions of air quality plans. Section 109(j) of 23 U.S.C. established consistency requirements to assure that highways are consistent with approved plans for air quality.

Procedures

The FHWA will serve as Executive Agent for FTA on all actions, reviews and meetings required to fulfill their mutual responsibility for Air Quality Conformity Findings. FHWA Division Offices will conduct reviews of conformity determinations for plans, TIPs and amendments, and provide guidance to the States and MPOs. When the review of conformity determinations for Transportation Plans and TIPs has been completed by the MPO and State DOT; the State DOT will provide U.S. DOT and Environmental Protection Agency (EPA) with copies of the conformity determinations along with plans and/or programs and other pertinent documents. EPA will normally be given 30 days for their review and comment. U.S. DOT will meet or teleconference with EPA as necessary to resolve pertinent comments that may result from the concurrent reviews. The FHWA Division Administrator (or designee) will make a conformity finding upon completion of the review by U.S. DOT and resolution of pertinent comments by

EPA. Information copies of all Air Quality conformity actions and correspondence will be provided to the FTA Regional Office and the EPA Regional Office. FHWA Division offices will keep the FTA Region office informed of the progress and relevant issues during the conformity review process.

E. Certification of Transportation Management Area (TMA) Transportation Planning Process

Background

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), and The Transportation Equity Act for the 21st Century (TEA-21) requires a joint FHWA/FTA certification of the transportation planning process for all Transportation Management Areas (TMAs) at least every three years. A joint certification review along with other documentation and site visits is the basis used for determining that the transportation planning process in a TMA meets or substantially meets the requirements of 23 C.F.R Part 450.

Procedures

The certification review of all TMAs will be a joint effort between the two agencies. A review team consisting of FHWA Division and FTA Regional Office personnel will be identified for each review. If necessary, other technical expertise will be added to the team. Either the FHWA Division or FTA Regional Office representative will be designated as the lead or co-lead for the review. The lead or co-lead agency will be responsible for scheduling the review, obtaining the material for the desk audit, logistics for the review, preparation of the agenda, determining the lead for the topics to be discussed, closeout after the review, preparation of the draft report, circulation to other Federal team members for comments, external circulation of the report to MPO, transit operator, State DOT, and other appropriate participants for review of factual accuracy.

Assignment of lead or co-lead agency responsibility will be determined based upon an evaluation of staff workload, modal interest and the complexity of the issues in an individual TMA. The schedule and assignments for certification reviews will be developed by the FTA Regional and FHWA Division Offices by July 1st for the next fiscal year. Topics for the on-site review will be developed jointly by FHWA and FTA, based on emphasis areas and issues of concern in the specific TMA including (at a minimum) the items in this MOA as well as CMS and ITS.

Certification of the TMAs will be by the FTA Regional and the FHWA Division Administrators. The final report (certification) of the review will be completed within 90 days of the on-site visit. The presentation of findings will be done jointly by FHWA and FTA, and will take place within 60 days of the issuance of the final report or at the next MPO policy committee meeting.

F. Corridor Studies/Alternatives Analysis

Background

All major transportation investments must emerge from a multimodal transportation planning process in order to be eligible for Federal funding. As part of the planning process, local project sponsors may perform a corridor level analysis of mode and alignment alternatives in corridors for which projects may be proposed. Corridor studies/alternatives analysis is a key planning tool undertaken within the multimodal metropolitan and statewide planning processes, supplemented by subsequent project development analyses, for determining appropriate solutions to transportation challenges.

Procedures

Each agency will participate in a corridor study/alternatives analysis until modal issues are clear and/or a DOT lead agency can be determined by agreement between the two agencies. Either agency may serve as DOT lead, dependent upon the issues involved and the relative predominance of the mode. The environmental work will remain with the identified modal agency. If an agency determines that there are no reasonable alternatives involving their modal interest, the agency may advise the study/analysis sponsor that the other party to this agreement will serve as DOT lead for the remainder of the study. Regardless of which U.S. DOT agency serves as lead for the study, every effort will be made to link planning and National Environmental Policy Act of 1969 as well as striving to streamline the environmental process.

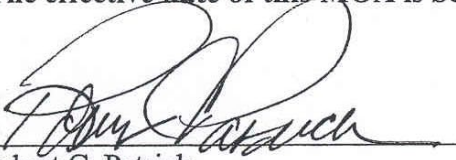
G. Consolidated Planning Grant and Electronic Signatures


The Consolidated Planning Grant (CPG) is a joint effort by the FHWA and FTA to create a single federal grant process for the respective transportation planning programs, thereby streamlining the administrative process to our customers. In FY 2004, FTA Region 6 has one CPG, which is in the state of Arkansas, and is administered by FTA. All parties agree to revisit the CPG concept in each respective state, and work towards implementing additional CPGs within Region 6.

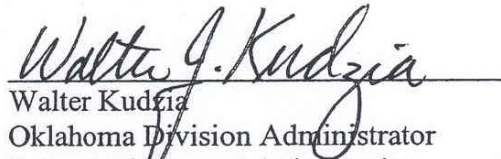
Likewise, all parties to this agreement are in favor of implementing electronic signatures for all appropriate planning products, thereby further streamlining the planning process for our customers. A task force will be formed to research the requirements of having electronic signatures.


This agreement may be canceled by mutual agreement of all parties or by a 30-day written notification of any signatory.

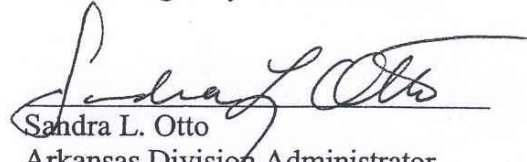
The effective date of this MOA is September 1, 2004.

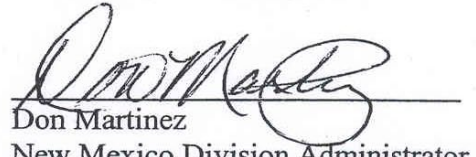

Robert C. Patrick
Regional Administrator
Federal Transit Administration


William A. Sussmann
Louisiana Division Administrator
Federal Highway Administration


Walter Kudzia
Oklahoma Division Administrator
Federal Highway Administration


C. D. (Dan) Reagan
Texas Division Administrator
Federal Highway Administration


Sandra L. Otto
Arkansas Division Administrator
Federal Highway Administration


Don Martinez
New Mexico Division Administrator
Federal Highway Administration

Attachment A – Tracking Performance Measures

Planning Topic	Lead Agency	Performance Measure	Actual Performance Measure
UPWP	FHWA/FTA	30 days	
STIP	FHWA/FTA	30 days – Initial Comments	
STIP	FHWA/FTA	60 days – Final Approval	
TIP Planning Findings	FHWA/FTA	60 days (concurrent with STIP approval)	
Certification Reviews – Final Report	FHWA/FTA	90 days from on-site review	
Certification Review – Presentation	FHWA/FTA	Within 60 days of final report	

File Attachments for Item:

20. CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF AMENDMENT NUMBER ONE TO CONTRACT K-2122-88: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, THE NORMAN MUNICIPAL AUTHORITY, AND CROSSLAND CONSTRUCTION COMPANY, INC., INCREASING THE CONTRACT AMOUNT BY \$13,916,603 FOR A REVISED CONTRACT AMOUNT OF \$13,948,853 TO PROVIDE CONSTRUCTION MANAGEMENT AT RISK SERVICES FOR THE EMERGENCY COMMUNICATIONS AND OPERATIONS CENTER (ECOC) AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: City of Norman Police Department

PRESENTER: Major Brent Barbour

ITEM TITLE: CONSIDERATION OF APPROVAL, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF AMENDMENT NUMBER ONE TO CONTRACT K-2122-88: BY AND BETWEEN THE CITY OF NORMAN, OKLAHOMA, THE NORMAN MUNICIPAL AUTHORITY, AND CROSSLAND CONSTRUCTION COMPANY, INC., INCREASING THE CONTRACT AMOUNT BY \$13,916,603 FOR A REVISED CONTRACT AMOUNT OF \$13,948,853 TO PROVIDE CONSTRUCTION MANAGEMENT AT RISK SERVICES FOR THE EMERGENCY COMMUNICATIONS AND OPERATIONS CENTER (ECOC) AND BUDGET APPROPRIATION AS OUTLINED IN THE STAFF REPORT.

BACKGROUND:

This item is an Amendment to Contract K-2122-88 with Crossland Construction Company, Inc., (Crossland) to provide completion of building the Emergency Communications and Operations Center Project (ECOC). The additional services would provide completed construction of the facility, grounds, and related elements as outlined in the current construction documents, bid package, and related contract at a guaranteed maximum price. The background and history of the Project that has solidified funding and brought the City to this point are outlined below.

On April 1, 2014, the voters of Norman approved Ordinance O-1314-33, extending the dedicated ½ percent Public Safety Sales Tax (PSST) permanently (effective October 1, 2015). The Ordinance directed that 71 employees added to the City public safety workforce be made permanent; an additional 19 employees be added over a period of four years (13 police officers to staff a School Resource Officer program; 4 additional Dispatchers; and 2 Emergency Vehicle Mechanics); and a program to replace or acquire Critical Public Safety Capital Needs be implemented. The Critical Public Safety Capital Needs were identified, in priority order, as follows:

Emergency Communication System Replacement - \$15,000,000
 Emergency Operations/Dispatch Center Facility - \$ 6,500,000
 Fire Apparatus Replacement Program - \$ 6,800,000
 Reconstruct/Relocate Fire Station #5 - \$ 3,500,000
TOTAL - \$31,800,000

In discussions and presentations leading up to the approval of the PSST extension, the plan to finance the Emergency Communications (Radio) System and Emergency Operations Center (ECOC) facilities through some type of debt issuance was discussed and acknowledged, due to the need to have those facilities functional before sufficient PSST revenues would accrue. Under this plan, available PSST Fund balance would be used as a partial “down payment” on the Communication System and ECOC facility and PSST Fund balance would be used to pay for the fire apparatus and Fire Station 5 reconstruction on a pay-as-you-go basis, as funds became available after the Radio System and ECOC were financed.

Subsequent to the passage of the PSST extension (“PSST II”), Fire Department staff provided a presentation to the City Manager and Council Finance Committee outlining the urgency of replacing a platform fire truck with an estimated cost of \$1,100,000 as the most critical need of the Fire Department. The Police Department staff also presented the need to hire the School Resource Officer program personnel a year in advance of the originally projected time. It was predicted that the PSST Fund would be able to absorb these advanced expenses, but the amount of debt financing required with this accelerated schedule would be increased. The Finance Department and Legal Department staff, in consultation with the City’s financial advisor and bond counsel teams, proposed a financing package, including the Emergency Communications System, the ECOC Facility and the fire platform truck. This comprehensive financing package for the Critical Public Safety Capital needs was discussed and approved by the Council Finance Committee on February 12, 2015. Proposals from qualified local and regional banking institutions to provide approximately \$22,825,000 in financing with a final maturity in 12 years, secured by a pledge of the PSST II proceeds, were solicited.

Responses in the form of interest rate proposals were received on March 10, 2015, and the lowest and best interest rate bid was forwarded for consideration of the Norman Municipal Authority (NMA) Trustees and Council. The Norman Municipal Authority Trustees and Council considered two resolutions: Resolution R-1415-90 was a resolution of the NMA to issue the debt, and R-1415-91 was a resolution of the City of Norman authorizing the issuance of the debt by the NMA, in an aggregate amount not to exceed \$22,825,000.

That financing was completed in 2015 and the design and construction process was moved forward then.

A Request for Qualifications (RFQ 1516-58) was issued on May 16, 2016 asking firms to present their qualifications for architectural and engineering design of the ECOC. Following vetting, including interviews and presentations, the Architects Design Group of Winter Park, Florida was selected for this project, its work to be completed in phases pursuant to Contract K-1617-69. Amendments have been brought to augment the scope of design based on funding.

On May 25, 2021, the City Council appropriated \$9,500,000 in American Recovery Plan Act entitlement funding (Resolution R-2021-128) to provide for full completion of the ECOC project. The 19,800 square foot design provides for all necessary components and fully hardens the entire structure to help ensure its usability in the event of severe weather emergencies

It was ultimately determined a Construction Manager at Risk (CMaR) format was preferable for this project much as for the City's many ongoing Norman Forward projects. Construction Manager at Risk is a process whereby the Norman Municipal Authority (NMA, or "Owner") will hire a Construction Manager to handle all of the bidding of the different sections of the work and all the subsequent construction activity for the project for a Guaranteed Maximum Price (GMP). The GMP is subsequently considered as an amendment to the CMaR contract after the most responsible bids are secured through the proper bidding procedures that govern public projects. Project bids are sealed and opened consistent with the City's bidding policies. This method allows the CMaR to work for the Owner while gathering bids from their best pre-qualified vendors and subcontractors, who have a history of working with the CMaR. This can deliver better bid pricing to a known project manager. Also, the CMaR process often maximizes opportunities to get participation from local, smaller sub-contractors. It can result in quicker project delivery without change orders due to the GMP agreed-on at the time of awarding the construction contract(s) to the CMaR.

On November 5, 2021, the City advertised its Request for Qualifications and on November 17, 2021, received CMaR service proposals from four (4) construction management service companies. Two (2) firms were selected for interviews, which were conducted on December 17, 2021. Based on their experience with other similar projects, Crossland Construction Company, Inc. was selected as the firm having the best proposal for managing the construction work on the ECOC. The CMaR contract, K-2122-88, was approved by City Council on January 18, 2022.

The construction will be fully bonded when the construction bids are awarded for the GMP. At that stage, the CMaR contract includes all of the necessary professional liability insurance and affidavits that come with all professional services contracts. Crossland Construction Company Inc. has used this method on many of their projects in the past decade, including work for the City of Norman/Norman Municipal Authority, University of Oklahoma, City of Wichita, KS, City of Tulsa, and Tulsa RiverParks Authority (Gathering Place).

For these projects, since the construction documents were nearly complete, the fee for pre-construction services was relatively small. The CMaR used the completed plans and specifications to secure all bids and create the GMP to be awarded by amendment to this contract. The amount awarded via this CMaR contract is those monthly expenses listed in the contract associated with doing the business of the CMaR for the anticipated duration of the project. If the project extends beyond this time, unless due to the extreme circumstances itemized in the contract, then those costs are borne by the CMaR, which are factors for the project to stay on time and within budget. The GMP is to be awarded as an amendment to the main contract, and will also include all of the CMaR's profit on the project, itemized in the amendment.

DISCUSSION:

The Architects Design Group of Winter Park, Florida completed construction documents for the project in November of 2022. On November 30, 2022, City of Norman Bid Package #1 for the project was released. Due to unexpected delays and related holiday conflicts, the original December 13, 2022 deadline for submission of bids was further delayed and advertised. Bids for the project were opened and reviewed on January 17, 2023. After review of the bids and

additional “value engineering” processes to reduce costs, the GMP for completion of the construction is now being offered for amendment and approval.

The City’s Consultants from ADG/Blatt, PC (Oklahoma City) have participated throughout the entire CMAr process up to our current point of beginning construction of the project. Further, the City Attorney's office has reviewed and approved the amendment documents.

The final GMP for the project has been proposed by Crossland at \$13,916,603. Due to cost increases in the current construction market, this price is higher than the Architects Design Group’s original estimates. The difference of approximately \$450,000 must be appropriated in order for the GMP amendment to be accepted.

After review and discussion by City staff, it is believed the most appropriate means for funding the project at the bid GMP will include a re-allocation of \$262,978 from the ARPA Vaccine Incentive Program (Account 22110303-44639; appropriated on September 14, 2021) and \$187,022 from the ARPA Affordable Housing project (Account 22330303-45799; appropriated on August 23, 2022) to the Special Grants Fund (ARPA) Emergency Communications Project, Construction (Account 22695523-46101; Project BG0083).

Funds from proceeds of the 2015 Norman Municipal Authority Sales Tax Notes (Revenue Bonds) are available in the Public Safety Sales Tax Fund, Emergency Communications Center Project; Construction (Account 15695523-46101; Project BP0029).

Additionally, a municipal trust such as the NMA cannot pass a sales tax exemption to a Construction Manager. Because this project is partially bond-funded through the Norman Municipal Authority, City Staff will instead collect invoices for taxable materials from Crossland every month and purchase those materials directly from the suppliers and provide them to the Construction Manager at Risk, to avoid the payment of sales tax on materials purchases related to the project.

RECOMMENDATION NO. 1:

Staff recommends that the City Council, acting jointly as the Norman Municipal Authority, approve Amendment One to CMAr Contract K-2122-88 with Crossland Construction Company, Inc., in the amount of \$13,916,603 for a revised contract amount of \$13,948,853 for construction services for the Emergency Communications and Operations Center project and, if approved, authorize the execution thereof.

RECOMMENDATION NO. 2:

Staff recommends that City Council re-allocate \$262,978 that was appropriated for the ARPA Vaccine Incentive Program, ARPA Miscellaneous Services-ARPA Incentives (account 22110303-44639) and \$187,022 that was appropriated for the ARPA Affordable Housing project, ARPA-Finance Miscellaneous-Other (account 22330303-45799) to the Emergency Operations Center ARPA project (BG0083, account 22695523-46101).

**AMENDMENT NO. 1 TO
CONSTRUCTION MANAGER AT RISK AGREEMENT BETWEEN
THE CITY OF NORMAN, NORMAN MUNICIPAL AUTHORITY AND
CROSSLAND CONSTRUCTION COMPANY, INC.**

THIS AMENDMENT NO. 1 TO CONSTRUCTION MANAGER AT RISK AGREEMENT (this “First Amendment”) is made as of January 25th, 2022, between the Norman Municipal Authority, a public trust having as its sole beneficiary, the City of Norman, Oklahoma (“NMA”) and CROSSLAND CONSTRUCTION COMPANY, INC., an Oklahoma corporation (the “Construction Manager”).

RECITALS:

A. The City of Norman and the Construction Manager entered into that certain Construction Manager at Risk Agreement (Contract No. K-2122-88) dated March 24, 2020, (the “Agreement”), for construction management services for the Emergency Communications & Operations Center project including plan review, design assistance, bidding services, and value engineering.

B. Pursuant to Section 2.2 of the Agreement, (i) once the drawings and specifications are complete, and after the award of subcontracts to subcontractors, the Construction Manager shall propose a guaranteed maximum price (“GMP”), which shall be the sum of all subcontracts, lump sum self-perform amounts, including allowances and contingencies, and the Construction Manager’s fee.

C. The original contract value for preconstruction services was \$32,250. Preconstruction Services were billed separately and are not included in GMP per previous Council approval attributed to the Norman ECOC Project.

AGREEMENT:

NOW, THEREFORE, in consideration of the foregoing recitals, which are incorporated herein by reference, other such good and valuable consideration, the receipt, and sufficiency of which are hereby acknowledged, and the promises and covenants set forth below, NMA and the Construction Manager hereby agree as follows:


1. GMP Established. The Construction Manager’s guaranteed maximum price for the Work inclusive of all subcontracts, lump sum self-perform amounts, including allowances and contingencies and the Construction Manager’s fee, is hereby agreed to be \$13,916,603 (derived from the total cost of work for the Construction Phase of \$12,040,841 + the Indirect Cost and Fee of \$1,875,762. The GMP is the total compensation from the City to the Construction Manager for its fee for the performance of the work in accordance with Contract Documents and pursuant to any of the following documents, as applicable:

- A. Basis for GMP. A written statement of its basis for the GMP proposal is attached hereto as Exhibit A and incorporated herein by reference.
- B. Documents. A list of the Drawings and Specifications, including all addenda that were used in preparation of the GMP Proposal, is attached hereto as Exhibit B and incorporated herein by reference.
- C. Allowances. A list of allowances related to the Work and a statement of their basis is attached hereto as Exhibit C and incorporated herein by reference.
- D. Assumptions. A list of the assumptions and clarifications made by the Construction Manager in the preparation of the GMP Proposal to supplement the information contained in the Drawings and Specifications is attached hereto as Exhibit D and incorporated herein by reference.
- E. Proposed GMP. The proposed GMP, including a statement of the estimated cost organized by trade categories, allowances, contingency, General Conditions, and other items and the Fee that comprise the GMP is attached hereto as Exhibit E and incorporated herein by reference.
- F. Substantial Completion. The Substantial Completion date upon which the GMP Proposal is based and a schedule of the Construction Documents issuance dates upon which the date of Substantial Completion is based is attached hereto as Exhibit F and incorporated herein by reference.
- I. Acceptance Period. The time limit for acceptance of the GMP Proposal is attached hereto as part of Exhibit I.
2. Effect of Amendment. In all other respects, the Agreement is affirmed and ratified and, except as expressly modified herein, all terms and conditions of the Agreement shall remain in full force and effect.
3. Non-Default. By executing this First Amendment, the Construction Manager affirmatively asserts that (i) NMA is not currently in default, nor has been in default at any time prior to this First Amendment, under any of the terms or conditions of this Agreement and (ii) any and all claims, known and unknown, relating to the Agreement and existing on or before the date of this First Amendment are forever waived.

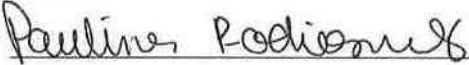
[SIGNATURES ON FOLLOWING PAGES]

IN WITNESS WHEREOF, the Parties have executed this FIRST AMENDMENT in multiple copies on the respective dates herein below reflected to be effective on the date executed by the Chairperson of the Norman Municipal Authority.

**CONSTRUCTION MANAGER
(CROSSLAND CONSTRUCTION COMPANY, INC.)**

By: 
Name: Aaron Savage
Title: Up-own
Date: 2.10.23

ATTEST:

By: 

Subscribed and sworn to me this 10 day of February, 2023.

Commission Number: 21009617
Expiration Date: 07/22/25



NORMAN MUNICIPAL AUTHORITY

Reviewed and approved for form and legality this _____ day of _____, 2023.

Office of the General Counsel

Approved by The City of Norman on this _____ day of _____, 2023.

By: _____
Larry Heikkila, Mayor

ATTEST:

By: _____
Brenda Hall, City Clerk

CROSSLAND

CONSTRUCTION COMPANY, INC.

Exhibit A – Basis for GMP

K-2122-88 – Emergency Communications & Operations Center (ECOC)

February 10th, 2023

408 NE 145th Place

Oklahoma City, OK 73013

tel 405.748.5043

fax 405.748.7214

Major Brent Barbour
Norman Police Department
Community & Staff Services Bureau

RE: Emergency Communications & Operations Center
Recommendation Award Letter Bid Package #01 - Letter #1

Dear Major Brent Barbour,

For the above referenced project, we are proposing a guaranteed maximum price (GMP) of thirteen million nine hundred sixteen thousand six hundred three dollars (**\$13,916,603**).

Bids for the Emergency Communications & Operations Center – Bid Package #1, were received and publicly read aloud in the city council chambers at 201 W Gray St. Norman, OK on January 17th, 2023, at 2:00 PM CST. The bidding process was conducted in accordance with the Oklahoma Public Competitive Bidding Act, 61 O.S. 1974, §101

Crossland Construction Company has reviewed the bids for qualifications, completeness, responsiveness, cost, & best value to the owner. For additional information, see breakout pages & summaries below.

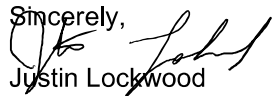
<u>Subcontractor / Supplier</u>	<u>Total</u>
3A Concrete (Crossland)	\$1,424,000
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Crossland, for this trade contract. Scope includes the entirety of trade contract 3A as detailed in Bid Package #01 documents. 	
4A Masonry (CIA Masonry)	\$83,300
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, CIA Masonry, for this trade contract. Scope includes the entirety of trade contract 4A as detailed in Bid Package #01 documents. 	
5A Structural Steel (Crossland)	\$1,077,000
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Crossland, for this trade contract. Scope includes the entirety of trade contract 5A as detailed in Bid Package #01 documents. <i>Apparent low bidder, Clint's Welding, provided list of exclusions including bonding and are considered non-responsive.</i> 	
6A Millwork (FADCO)	\$355,767
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, FADCO, for this trade contract. Scope includes the entirety of trade contract 6A as detailed in Bid Package #01 documents. 	
7A Roofing (Redland Roofing)	\$381,300
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Redland Roofing, for this trade contract. Scope includes the entirety of trade contract 7A as detailed in Bid Package #01 documents. 	

7B Joint Sealants and Waterproofing (CHM Weatherguard)	\$21,115
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, CHM Weatherguard, for this trade contract. Scope includes the entirety of trade contract 7B as detailed in Bid Package #01 documents. 	
8A Door Assemblies Supply (CBS Doors & Hardware)	\$189,275
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, CBS Doors & Hardware, for this trade contract. Scope includes the entirety of trade contract 8A as detailed in Bid Package #01 documents. 	
8B Door Assemblies Install (GIO Construction)	\$21,275
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, GIO Construction, for this trade contract. Scope includes the entirety of trade contract 8B as detailed in Bid Package #01 documents. 	
8C Glass and Glazing (Ave. C Glass)	\$591,076
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Ave. C Glass, for this trade contract. Scope includes the entirety of trade contract 8C as detailed in Bid Package #01 documents. 	
9A Gypsum Assemblies (Wiljo Interiors)	\$762,365
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Wiljo Interiors, for this trade contract. Scope includes the entirety of trade contract 9A as detailed in Bid Package #01 documents. 	
9B Flooring and Wall Tile (Bryan's Flooring)	\$165,951
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Bryan's Flooring, for this trade contract. Scope includes the entirety of trade contract 9B as detailed in Bid Package #01 documents. 	
9C Painting (Tulsa Christian Brothers)	\$92,950
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Tulsa Christian Brothers, for this trade contract. Scope includes the entirety of trade contract 9C as detailed in Bid Package #01 documents. 	
9E Access Flooring (Burgess)	\$223,300
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Burgess, for this trade contract. Scope includes the entirety of trade contract 9E as detailed in Bid Package #01 documents. 	
10A Specialties (Czarniecki)	\$135,484
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Czarniecki, for this trade contract. Scope includes the entirety of trade contract 10A as detailed in Bid Package #01 documents. 	
10B Signage (Vital Signs)	\$25,475
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Vital Signs, for this trade contract. Scope includes the entirety of trade contract 10B as detailed in Bid Package #01 documents. 	
10D Aluminum Canopies (Play-by-Design)	\$30,300
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Play-by-Design, for this trade contract. Scope includes the entirety of trade contract 10D as detailed in Bid Package #01 documents. 	
12A Window Treatments (Contract Drapery)	\$42,960
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Contract Drapery, for this trade contract. Scope includes the entirety of trade contract 12A as detailed in Bid Package #01 documents. 	
21A Fire Suppression (Fraiser Fire)	\$201,000
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Fraiser Fire, for this trade contract. Scope includes the entirety of trade contract 21A as detailed in Bid Package #01 documents. 	
22A Plumbing (T&T Industrial)	\$395,788
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, T&T Industrial, for this trade contract. Scope includes the entirety of trade contract 22A as detailed in Bid Package #01 documents. 	

23A HVAC (Dense Mechanical)	\$1,370,000
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Dense Mechanical, for this trade contract. Scope includes the entirety of trade contract 23A as detailed in Bid Package #01 documents. 	
26A Electrical (Prime Electric)	\$1,700,858
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Prime Electric, for this trade contract. Scope includes the entirety of trade contract 26A as detailed in Bid Package #01 documents. 	
27A AV, Data & Communications (Prime Electric)	\$1,198,112
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Prime Electric, for this trade contract. Scope includes the entirety of trade contract 27A as detailed in Bid Package #01 documents. <i>Apparent low bidder, Ford AV, provided list of exclusions including work necessary to complete entirety of scope and are considered non-responsive.</i> 	
28A Fire Alarm (Stryker Integrated)	\$18,500
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Stryker Integrated, for this trade contract. Scope includes the entirety of trade contract 28A as detailed in Bid Package #01 documents. 	
28B Access Control (Trans-Tel)	\$215,156
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Trans-Tel, for this trade contract. Scope includes the entirety of trade contract 28B as detailed in Bid Package #01 documents. 	
31A Earthwork (Hammer)	\$294,760
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Hammer, for this trade contract. Scope includes the entirety of trade contract 31A as detailed in Bid Package #01 documents. 	
32A Site Concrete (Turning Point)	\$148,700
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Turning Point, for this trade contract. Scope includes the entirety of trade contract 32A as detailed in Bid Package #01 documents. 	
32B Asphalt (Turning Point)	\$215,200
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Turning Point, for this trade contract. Scope includes the entirety of trade contract 32B as detailed in Bid Package #01 documents. 	
32C Fencing (Superior Fence)	\$77,327
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Superior Fence, for this trade contract. Scope includes the entirety of trade contract 32C as detailed in Bid Package #01 documents. 	
32D Landscape, Irrigation, & Plantings (Greenshade)	\$179,165
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, Greenshade, for this trade contract. Scope includes the entirety of trade contract 32D as detailed in Bid Package #01 documents. 	
33A Site Utilities (H&H Plumbing)	\$180,270
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, H&H Plumbing, for this trade contract. Scope includes the entirety of trade contract 33A as detailed in Bid Package #01 documents. 	
33B Storm Sewer Systems (H&H Plumbing)	\$140,520
<ul style="list-style-type: none"> Crossland Construction is recommending responsive low bidder, H&H Plumbing, for this trade contract. Scope includes the entirety of trade contract 33B as detailed in Bid Package #01 documents. 	

Please contact me should you have any questions.

Sincerely,



Justin Lockwood
Director of Preconstruction
Crossland Construction Company

Project Documents List

Emergency Communications & Operations Center

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Specifications Dated 11.22.22 from Architects Design Group

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-----	GEOTECHNICAL ENGINEERING REPORT	11/18/2022
-----	ADDITIONAL GEOTECH EXPLORATION	11/18/2022

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01 25 00	SUBSTITUTION PROCEDURES	11/18/2022
01 26 00	CONTRACT MODIFICATION PROCEDURES	11/18/2022
01 29 00	PAYMENT PROCEDURES	11/18/2022
01 31 00	PROJECT MANAGEMENT AND COORDINATION	11/18/2022
01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION	11/18/2022
01 32 33	PHOTOGRAPHIC DOCUMENTATION	11/18/2022
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01 40 00	QUALITY REQUIREMENTS	11/18/2022
01 42 00	REFERENCES	11/18/2022
01 50 00	TEMPORARY FACILITIES AND CONTROLS	11/18/2022
01 60 00	PRODUCT REQUIREMENTS	11/18/2022
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01 77 00	CLOSEOUT PROCEDURES	11/18/2022
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01 79 00	DEMONSTRATION AND TRAINING	11/18/2022

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03 35 45	SEALED CONCRETE FINISHING	11/18/2022
03 45 00	PRECAST CONCRETE SHAPES	11/18/2022

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05 21 00	STEEL JOIST FRAMING	11/18/2022
05 31 00	STEEL DECKING	11/18/2022
05 50 00	METAL FABRICATIONS	11/18/2022
05 52 13	PIPE AND TUBE RAILINGS	11/18/2022
05 75 00	METAL SCREEN WALLS	11/18/2022

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES		
SPECIFICATION	DESCRIPTION	Date Issued
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06 41 16	PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS	11/18/2022
06 64 00	PLASTIC PANELING	11/18/2022

DIVISION 07 - THERMAL AND MOISTURE PROTECTION		
SPECIFICATION	DESCRIPTION	Date Issued
07 13 26	SELF-ADHERING SHEET MEMBRANE WATERPROOFING	11/18/2022
07 21 00	BUILDING INSULATION	11/18/2022
07 25 00	WEATHER BARRIERS	11/18/2022
07 26 10	UNDERSLAB VAPOR BARRIER	11/18/2022
07 54 00	THERMOPLASTIC MEMBRANE ROOFING (TPO)	11/18/2022
07 62 00	SHEET METAL FLASHING AND TRIM	11/18/2022
07 81 23	INTUMESCENT FIRE PROTECTION	11/18/2022
07 84 13	PENETRATION FIRESTOPPING	11/18/2022
07 92 00	JOINT SEALANTS	11/18/2022

DIVISION 08 - OPENINGS		
SPECIFICATION	DESCRIPTION	Date Issued
08 11 13	HOLLOW METAL DOORS AND FRAMES	11/18/2022
08 14 16	FLUSH WOOD DOORS	11/18/2022
08 31 13	ACCESS DOORS AND FRAMES	11/18/2022
08 33 23	OVERHEAD COILING DOORS	11/18/2022
08 56 53.	13 WIND AND IMPACT SECURITY WINDOWS	11/18/2022
08 71 00	DOOR HARDWARE	11/18/2022
08 80 00	GLAZING	11/18/2022
08 83 00	MIRRORS	11/18/2022
08 91 19	FIXED LOUVERS	11/18/2022

DIVISION 09 - FINISHES		
SPECIFICATION	DESCRIPTION	Date Issued
09 22 16	NON-STRUCTURAL METAL FRAMING	11/18/2022
09 24 00	CEMENT PLASTERING	11/18/2022
09 29 00	GYPSUM BOARD	11/18/2022
09 30 00	TILING	11/18/2022
09 51 13	ACOUSTICAL PANEL CEILINGS	11/18/2022
09 54 23	SUSPENDED METAL CEILINGS	11/18/2022
09 65 13	RESILIENT BASE AND ACCESSORIES	11/18/2022
09 65 66	RESILIENT ATHLETIC FLOORING	11/18/2022
09 68 13	TILE CARPETING	11/18/2022
09 69 00	ACCESS FLOORING	11/18/2022

09 84 13	FIXED SOUND-ABSORPTIVE PANELS	11/18/2022
09 91 00	PAINTING	11/18/2022

DIVISION 10 - SPECIALTIES		
SPECIFICATION	DESCRIPTION	Date Issued
10 14 19	DIMENSIONAL LETTER SIGNAGE	11/18/2022
10 14 23	INTERIOR SIGNAGE	11/18/2022
10 22 39.19	FOLDING GLASS-PANEL PARTITIONS	11/18/2022
10 26 00	WALL PROTECTION	11/18/2022
10 28 13	TOILET ACCESSORIES	11/18/2022
10 41 16	EMERGENCY KEY CABINETS	11/18/2022
10 43 13	DEFIBRILLATOR SPECIALTIES	11/18/2022
10 44 00	FIRE PROTECTION SPECIALTIES	11/18/2022
10 56 26	STORAGE SHELVING UNITS (MECHANICALLY ASSISTED)	11/18/2022
10 73 16	ALUMINUM CANOPIES	11/18/2022
10 75 16	GROUND-SET FLAGPOLES	11/18/2022

DIVISION 11 - EQUIPMENT		
SPECIFICATION	DESCRIPTION	Date Issued
11 94 13	MISCELLANEOUS EQUIPMENT	11/18/2022

DIVISION 12 - FURNISH		
SPECIFICATION	DESCRIPTION	Date Issued
12 24 13	ROLLER WINDOW SHADES	11/18/2022
12 36 61	SOLID SURFACE COUNTERTOPS	11/18/2022
12 48 16	ENTRANCE FLOOR GRILLES	11/18/2022
12 48 43	WALK OFF MATS	11/18/2022
12 59 83.3	CUSTOM SYSTEM FURNITURE: 911 DISPATCH CONSOLES	11/18/2022
12 93 13	BICYCLE RACKS	11/18/2022

DIVISION 13 - SPECIAL CONSTRUCTION		
SPECIFICATION	DESCRIPTION	Date Issued
13 34 19	METAL BUILDING SYSTEMS	11/18/2022

DIVISION 21 - FIRE SUPPRESSION		
SPECIFICATION	DESCRIPTION	Date Issued
21 05 00	COMMON WORK RESULTS FOR FIRE-SUPPRESSION	11/18/2022
21 05 48	VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT	11/18/2022
21 13 13	WET-PIPE SPRINKLER SYSTEMS	11/18/2022
21 13 16	DRY-PIPE SPRINKLER SYSTEMS	11/18/2022

DIVISION 22 - PLUMBING		
SPECIFICATION	DESCRIPTION	Date Issued
22 05 00	COMMON WORK RESULTS FOR PLUMBING	11/18/2022

22 05 23	GENERAL-DUTY VALVES FOR PLUMBING PIPING	11/18/2022
22 05 29	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT	11/18/2022
22 05 48	SEISMIC CONTROLS FOR PLUMBING	11/18/2022
22 05 53	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT	11/18/2022
22 07 19	PLUMBING PIPING INSULATION	11/18/2022
22 11 13	FACILITY WATER DISTRIBUTION PIPING	11/18/2022
22 11 16	DOMESTIC WATER PIPING	11/18/2022
22 11 19	DOMESTIC WATER PIPING SPECIALTIES	11/18/2022
22 11 23	DOMESTIC WATER PUMPS	11/18/2022
22 13 13	FACILITY SANITARY SEWERS	11/18/2022
22 13 16	SANITARY WASTE AND VENT PIPING	11/18/2022
22 13 19	SANITARY WASTE PIPING SPECIALTIES	11/18/2022
22 13 23	SANITARY WASTE INTERCEPTORS	11/18/2022
22 15 13	GENERAL-SERVICE COMPRESSED-AIR PIPING	11/18/2022
22 34 00	FUEL-FIRED, DOMESTIC-WATER HEATERS	11/18/2022
22 42 13	COMMERCIAL PLUMBING FIXTURES	11/18/2022
22 47 16	PRESSURE WATER COOLERS	11/18/2022

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING		
SPECIFICATION	DESCRIPTION	Date Issued
23 00 00	BASIC MECHANICAL REQUIREMENTS	11/18/2022
23 00 01	TEMPORARY USE OF MECHANICAL EQUIPMENT	11/18/2022
23 00 10	COMMON WORK RESULTS FOR MECHANICAL	11/18/2022
23 05 29	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT	11/18/2022
23 05 48	VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT	11/18/2022
23 05 53	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT	11/18/2022
23 05 93	TESTING, ADJUSTING, AND BALANCING FOR HVAC	11/18/2022
23 07 13	DUCT INSULATION	11/18/2022
23 07 19	HVAC PIPING INSULATION	11/18/2022
23 09 00	INSTRUMENTATION AND CONTROL FOR HVAC	11/18/2022
23 11 23	FACILITY NATURAL-GAS PIPING	11/18/2022
23 21 13	HYDRONIC PIPING	11/18/2022
23 23 00	REFRIGERANT PIPING	11/18/2022
23 31 13	METAL DUCTS	11/18/2022
23 33 00	AIR DUCT ACCESSORIES	11/18/2022
23 34 23	HVAC POWER VENTILATORS	11/18/2022
23 37 13	DIFFUSERS, REGISTERS, AND GRILLES	11/18/2022
23 55 33	FUEL-FIRED UNIT HEATERS	11/18/2022
23 74 33	DEDICATED OUTDOOR-AIR UNITS	11/18/2022
23 81 27	VARIABLE REFRIGERANT FLOW AIR CONDITIONERS	11/18/2022
23 82 39	16 ELECTRIC UNIT HEATERS	11/18/2022
23 90 00	LOUVERS AND VENTS	11/18/2022

DIVISION 26 - ELECTRICAL

SPECIFICATION	DESCRIPTION	Date Issued
26 05 00	BASIC ELECTRICAL REQUIREMENTS	11/18/2022
26 05 01	ELECTRICAL TEMPORARY FACILITIES	11/18/2022
26 05 04	CLEANING, INSPECTION, AND TESTING OF ELECTRICAL EQUIPMENT	11/18/2022
26 05 19	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES	11/18/2022
26 05 26	ELECTRICAL GROUNDING	11/18/2022
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	11/18/2022
26 05 33	ELECTRICAL RACEWAYS	11/18/2022
26 05 34	ELECTRICAL BOXES AND FITTINGS	11/18/2022
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS	11/18/2022
26 05 73	SHORT CIRCUIT/COORDINATION AND ARC-FLASH HAZARD STUDY	11/18/2022
26 09 23	LIGHTING CONTROL DEVICES	11/18/2022
26 22 00	LOW-VOLTAGE TRANSFORMERS	11/18/2022
26 24 16	PANELBOARDS	11/18/2022
26 27 02	EQUIPMENT WIRING SYSTEMS	11/18/2022
26 27 26	WIRING DEVICES	11/18/2022
26 28 16	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	11/18/2022
26 29 00	LOW-VOLTAGE CONTROLLERS	11/18/2022
26 32 00	PACKAGED GENERATOR ASSEMBLIES	11/18/2022
26 33 53	STATIC UNINTERRUPTIBLE POWER SUPPLY	11/18/2022
26 36 00	TRANSFER SWITCHES	11/18/2022
26 36 01	GENERATOR TAP BOX	11/18/2022
26 41 13	LIGHTNING PROTECTION FOR STRUCTURES	11/18/2022
26 43 13	SURGE PROTECTIVE DEVICES	11/18/2022
26 51 19	LED INTERIOR LIGHTING	11/18/2022
26 56 19	LED EXTERIOR LIGHTING	11/18/2022

DIVISION 27 - COMMUNICATIONS		
SPECIFICATION	DESCRIPTION	Date Issued
27 00 10	TECHNOLOGY GENERAL PROVISIONS	11/18/2022
27 05 26	GROUNDING AND BONDING FOR COMMUNICATION SYSTEMS	11/18/2022
27 05 28	RACEWAYS FOR TECHNOLOGY	11/18/2022
27 10 00	STRUCTURED CABLING SYSTEMS	11/18/2022
27 11 26	COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS	11/18/2022
27 41 00	AUDIO VISUAL SYSTEMS	11/18/2022
27 41 34	BROADBAND DISTRIBUTION SYSTEM	11/18/2022
27 51 23	INTERCOM COMMUNICATION SYSTEMS	11/18/2022

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY		
SPECIFICATION	DESCRIPTION	Date Issued
28 05 37	SECURITY VOICE COMMUNICATIONS – DISTRIBUTED ANTENNA SYSTEM	11/18/2022
28 10 00	ELECTRONIC SECURITY SYSTEMS	11/18/2022
28 20 00	CLOSED CIRCUIT TELEVISION/VIDEO SURVEILLANCE SYSTEM	11/18/2022

DIVISION 31 - EARTHWORK		
SPECIFICATION	DESCRIPTION	Date Issued
31 10 00	SITE CLEARING	11/18/2022
31 11 00	STORM WATER POLLUTION PREVENTION PLAN	11/18/2022
31 20 00	EARTH MOVING	11/18/2022
31 20 01	STRUCTURAL EARTH MOVING	11/18/2022
31 31 16	TERMITE CONTROL	11/18/2022
31 63 29	DRILLED CONCRETE PIERS AND SHAFTS	11/18/2022

DIVISION 32 - EXTERIOR IMPROVEMENTS		
SPECIFICATION	DESCRIPTION	Date Issued
32 12 16	ASPHALT PAVING	11/18/2022
32 13 13	CONCRETE PAVING	11/18/2022
32 13 73	CONCRETE PAVING JOINT SEALANTS	11/18/2022
32 31 13	CHAIN LINK FENCES AND GATES	11/18/2022
32 31 32	PRECAST CONCRETE FENCING	11/18/2022
32 84 00	IRRIGATION	11/18/2022
32 92 00	SODDING	11/18/2022
32 93 00	PLANT MATERIAL AND OPERATION	11/18/2022

DIVISION 33 - UTILITIES		
SPECIFICATION	DESCRIPTION	Date Issued
33 41 00	STORM DRAINAGE UTILITY PIPING	11/18/2022

Other reports to be included as part of the contract documents:

Crossland Construction – Bid Package #1 Dated 11/30/2022.

Allowances

- **Site Fencing at Vehicle Gate\$3,500**
 - This is for costs associated with replacing the site fencing shown as CMU with chain-link fencing.
- **Central Vacuum System.....\$10,000**
 - This is for costs associated with procuring and installing central vacuum system that was not included in bid day pricing.
- **Courtyard Fencing\$26,000**
 - Costs to provide courtyard fencing. Final fencing type is to be reviewed and approved by design team and owner.
- **Rated Hardware at Mech/Gen Gates\$10,000**
 - Costs for forthcoming ASI to include rated gate hardware per CoN comments.

Assumptions.

1. City of Norman to provide and install dispatch consoles, console lockers, residential appliances and shelving units.
2. City of Norman accepted chain link fence in lieu of CMU site fencing at main vehicle gate.
3. City of Norman accepted courtyard fencing to be removed from scope. Pricing requests are to be sent to add a more economical fence.
4. Test borings were provided prior to GMP letter, and no ground water was found onsite. There is currently no allowance set for providing pier casings. The bid unit cost of casing piers will be taken out of contingency if water is discovered during pier drilling activities.
5. The following alternates were accepted by the City of Norman (costs shown in GMP Summary):
 - a. Alternate #3 – Upgrading the UPS system.
 - b. Alternate #6 – Additional canopy at main entry and north covered parking.
 - c. Alternate #7 – Paving the east lot.
 - d. Alternate #8 – Outdoor break area landscaping.
6. All materials testing is to be provided by the City of Norman. Costs for re-testing failed tests will be on the contractor.
7. Contingency amount was reduced below 3% to account for value engineering options that are in currently under review. Formally approved value engineering options are to be utilized to return contingency amount to a minimum 3% of the overall construction contract.

Proposed GMP Bid Tab

ECOC			CROSSLAND						
Bid Package # 1			CONSTRUCTION COMPANY, INC.						
Bid Tab									
ECOC			Bid Package # 1	Subcontractor	Alternate UPS Upgrade	Alternate 6 - Entry/Parking	Alternate 7 - East Lot	Alternate 8 - Outdoor Break	Total Alternates
SF:	20,722								
Date: 2/12/2023									
BP#	Description	Bid Price	Subcontractor	Bid Price	Bid Price	Bid Price	Bid Price		
3A	Concrete	\$ 1,424,000	Crossland	\$ -	-	-	-		\$ 1,424,000
4A	Masonry	\$ 83,300	CIA Masonry	\$ -	\$ -	\$ -	\$ -		\$ 83,300
5A	Structural Steel	\$ 1,037,000	Crossland	\$ -	\$ 40,000	\$ -	\$ -		\$ 1,077,000
6A	Architectural Millwork	\$ 355,767	Fadco	\$ -	\$ -	\$ -	\$ -		\$ 355,767
7A	Roofing	\$ 352,800	Redland Roofing	\$ -	\$ 28,500	\$ -	\$ -		\$ 381,300
7B	Joint Sealants & Waterproofing	\$ 18,550	CHM	\$ -	\$ -	\$ 2,565	\$ -		\$ 21,115
8A	Door Assemblies - Supply	\$ 189,275	CBS Doors	\$ -	\$ -	\$ -	\$ -		\$ 189,275
8B	Door Assemblies - Install	\$ 21,275	GIO	\$ -	\$ -	\$ -	\$ -		\$ 21,275
8C	Glass & Glazing	\$ 591,076	AVE. C Glass	\$ -	\$ -	\$ -	\$ -		\$ 591,076
8D	Overhead Doors	\$ -	ALLOWANCE	-	-	-	-		\$ -
9A	Gypsum Assemblies	\$ 762,365	Wiljo	\$ -	\$ -	\$ -	\$ -		\$ 762,365
9B	Flooring & Wall Tile	\$ 165,951	Bryans Flooring	\$ -	\$ -	\$ -	\$ -		\$ 165,951
9C	Painting & Wall Covering	\$ 92,950	T.C. Bros	\$ -	\$ -	\$ -	\$ -		\$ 92,950
9D	Sealed Concrete	\$ 33,092	TCS Flooring	\$ -	\$ -	\$ -	\$ -		\$ 33,092
9E	Access Flooring	\$ 223,300	Burgess	\$ -	\$ -	\$ -	\$ -		\$ 223,300
10A	Specialties	\$ 135,484	Czarnecki	\$ -	\$ -	\$ -	\$ -		\$ 135,484
10B	Signage	\$ 25,475	Vital Signs	\$ -	\$ -	\$ -	\$ -		\$ 25,475
10C	Dispatch Consoles and Lockers		OWNER	-	-	-	-		\$ -
10D	Aluminum Canopies	\$ 30,300	Play by Design	\$ -	\$ -	\$ -	\$ -		\$ 30,300
11A	Food Service Equipment	\$ -	In Allowances	-	-	-	-		\$ -
12A	Window Treatments	\$ 42,960	Contract Drapery	\$ -	\$ -	\$ -	\$ -		\$ 42,960
13A	Special Construction		Crossland	\$ -	\$ -	\$ -	\$ -		\$ -
21A	Fire Suppression	\$ 201,000	Frazier	\$ -	\$ -	\$ -	\$ -		\$ 201,000
22A	Plumbing	\$ 395,788	T&T Industrial	\$ -	\$ -	\$ -	\$ -		\$ 395,788
23A	HVAC	\$ 1,370,000	Dense Mech.	-	-	-	-		\$ 1,370,000
26A	Electrical	\$ 1,682,230	Prime	\$ 9,997	\$ 8,631	\$ -	\$ -		\$ 1,700,858
27A	AV, Data & Communications	\$ 1,198,112	Prime	\$ -	\$ -	\$ -	\$ -		\$ 1,198,112
28A	Fire Alarm	\$ 18,500	Stryker Integrated	\$ -	\$ -	\$ -	\$ -		\$ 18,500
28B	Access Control	\$ 215,156	Trans Tel	\$ -	\$ -	\$ -	\$ -		\$ 215,156
31A	Earthwork	\$ 291,760	Hammer	\$ -	\$ -	\$ 3,000	\$ -		\$ 294,760
32A	Site Concrete	\$ 138,900	Turning Point	\$ -	\$ -	\$ 3,900	\$ 5,900		\$ 148,700
32B	Asphalt	\$ 178,300	Turning Point	\$ -	\$ -	\$ 36,900	\$ -		\$ 215,200
32C	Fencing	\$ 65,331	Superior Fence	\$ -	\$ 11,996	\$ -	\$ -		\$ 77,327
32D	Landscape, Irrigation, & Plantings	\$ 158,029	Greenshade	\$ -	\$ -	\$ -	\$ 21,136		\$ 179,165
33A	Site Utilities (Gas, Water, Sewer)	\$ 180,270	H&H	\$ -	\$ -	\$ -	\$ -		\$ 180,270
33B	Storm Sewer Systems	\$ 140,520	H&H	\$ -	\$ -	\$ -	\$ -		\$ 140,520
	Allowances	\$ 49,500							\$ 49,500
	Subtotal Direct Costs	\$ 11,868,316		\$ 9,997	\$ 89,127	\$ 46,365	\$ 27,036		\$ 12,040,841
	Construction Contingency	\$ 228,049		\$ 300	\$ 2,674	\$ 1,391	\$ 811		\$ 233,225
	General Conditions	\$ 803,520							\$ 803,520
	Project Requirements	\$ 258,643							\$ 258,643
	Insurance	\$ 89,012		\$ 75	\$ 668	\$ 348	\$ 203		\$ 90,306
	Construction Phase Fee	\$ 483,535		\$ 379	\$ 3,375	\$ 1,756	\$ 1,024		\$ 490,069
	GMP Total (No Alternates)	\$ 13,731,075		\$ 10,750	\$ 95,844	\$ 49,859	\$ 29,074		\$ 13,916,603
			Accepted?	Y	Y	Y	Y		
	Base BP# Total w/Accepted Alternates	\$ 13,916,603							

Trade Specific Bid Tabs

Trade Contract Identification									
3A Concrete									
Trade Contractor - Bid Summary									
Contractor:		Crossland							
Base Bid:		\$ 1,424,000							
Alt 1		\$ 72,000							
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ 72,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
BASE BID :		Crossland			Price				
TOTAL ALT:		Crossland			\$ 72,000.00				
Trade Contract Identification									
4A Masonry									
Trade Contractor - Bid Summary									
Contractor:		CIA Masonry	Masonry IV						
Base Bid:		\$ 83,300	\$ 212,000						
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
		Recommended Trade Contractor				Price			
BASE BID :		CIA Masonry				\$ 83,300.00			
TOTAL ALT:		CIA Masonry				\$ -			
Trade Contract Identification									
5A Structural Steel									
Trade Contractor - Bid Summary									
Contractor:	Wiebe	Crossland	Clinto Welding						
Base Bid:	\$ 1,200,000	\$ 1,037,000	\$ 982,047						
Alt 1	\$ 7,000	\$ 3,400	\$ 6,000						
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6	\$ 48,500	\$ 40,000	\$ 70,500						
Alt 7									
Alt 8									
Total Alternates	\$ 55,500	\$ 43,400	\$ 76,500	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
		Recommended Trade Contractor				Price			
BASE BID :		Crossland				\$ 1,037,000.00			
TOTAL ALT:		Crossland				\$ 43,400.00			
Trade Contract Identification									
6A Millwork									
Trade Contractor - Bid Summary									
Contractor:		Fadco	Wood Systems						
Base Bid:		\$ 355,767	\$ 339,776						
Alt 1			\$ 3,000						
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ 3,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
		Recommended Trade Contractor				Price			
BASE BID :		Fadco				\$ 355,767.00			
TOTAL ALT:		Fadco				\$ -			

Trade Contract Identification									
TA Roofing									
Trade Contractor - Bid Summary									
Contractor:		Graco Roofing	OK Roofing	Sooner Recon	Coontz	Redland Roofing			
Base Bid:		\$ 383,000	\$ 620,358	\$ 491,000	\$ 388,500	\$ 352,800			
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6		\$ -	\$ 50,403	\$ 35,000	\$ 30,000	\$ 28,500			
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ 50,403	\$ 35,000	\$ 30,000	\$ 28,500	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:		Redland Roofing				\$	352,800.00		
TOTAL ALT:		Redland Roofing				\$	28,500.00		
Trade Contract Identification									
TB Joint Sealants & Waterproofing									
Trade Contractor - Bid Summary									
Contractor:		Bone Dry	CHM	OK Roofing	Alpha Insulation				
Base Bid:	\$ 26,386		\$ 18,550	\$ 28,689	\$ 32,025				
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7	\$ 1,832		\$ 2,565	\$ 2,770	\$ 1,200				
Alt 8									
Total Alternates	\$ 1,832	\$ -	\$ 2,565	\$ 2,770	\$ 1,200	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:		CHM				\$	18,550.00		
TOTAL ALT:		CHM				\$	2,565.00		
Trade Contract Identification									
8A DFHW-Supply									
Trade Contractor - Bid Summary									
Contractor:		Piper	CBS Doors						
Base Bid:		\$ 255,000	\$ 189,275						
Alt 1		\$ 18,800	\$ 14,545						
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ 18,800	\$ 14,545	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:		CBS Doors				\$	189,275.00		
TOTAL ALT:		CBS Doors				\$	14,545.00		
Trade Contract Identification									
8A DFHW-Install									
Trade Contractor - Bid Summary									
Contractor:		GIO							
Base Bid:	\$ 21,275								
Alt 1	\$ 2,503								
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ 2,503	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:		GIO				\$	21,275.00		
TOTAL ALT:		GIO				\$	2,503.00		

Trade Contract Identification									
8C Glass & Glazing									
Trade Contractor - Bid Summary									
Contractor:				AVE. C Glass					
Base Bid:				\$ 591,076					
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				AVE. C Glass		\$	591,076.00		
TOTAL ALT:				AVE. C Glass		\$	-		
Trade Contract Identification									
8D Overhead Doors (Alternate 1)									
Trade Contractor - Bid Summary									
Contractor:									
Base Bid:									
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				#N/A		\$	-		
TOTAL ALT:				#N/A			#N/A		
Trade Contract Identification									
9A Gypsum Assembly & Ceiling Systems									
Trade Contractor - Bid Summary									
Contractor:		Corona Drywall	Higgins Group				Willjo		
Base Bid:		\$ 760,320	\$ 885,500				\$ 762,365		
Alt 1		\$ 17,064	\$ 116,500				\$ 13,030		
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ 17,064	\$ 116,500	\$ -	\$ -	\$ 13,030	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				Willjo		\$	762,365.00		
TOTAL ALT:				Willjo		\$	13,030.00		
Trade Contract Identification									
9B Flooring & Wall Tile									
Trade Contractor - Bid Summary									
Contractor:	Bryans Flooring	L Douglas		TCS Flooring					
Base Bid:	\$ 165,951	\$ 325,539		\$ 227,206					
Alt 1	\$ 3,643	\$ 2,953		\$ -					
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ 3,643	\$ 2,953	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				Bryans Flooring		\$	165,951.00		
TOTAL ALT:				Bryans Flooring		\$	3,643.00		

Trade Contract Identification									
3C Painting & Wall Covering									
Trade Contractor - Bid Summary									
Contractor:	ALPR			Cherokee	Grace	T.C. Bros	W/H Bros	Adv. Commercial	
Base Bid:	\$ 150,000			\$ 142,818	\$ 136,676	\$ 92,950	\$ 93,333	\$ 182,490	
Alt 1	\$ 20,400			\$ 17,177		\$ 13,123	\$ 17,133	\$ 2,840	
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6	\$ 4,800						\$ 5,000	\$ 12,500	
Alt 7									
Alt 8									
Total Alternates	\$ 25,200	\$ -	\$ -	\$ 17,177	\$ -	\$ 13,123	\$ 22,133	\$ 15,340	
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				T.C. Bros		\$ 92,950.00			
TOTAL ALT:				T.C. Bros		\$ 13,123.40			
Trade Contract Identification									
3D Sealed Concrete Finishing									
Trade Contractor - Bid Summary									
Contractor:				TCS Flooring					
Base Bid:				\$ 33,032					
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				TCS Flooring		\$ 33,032.39			
TOTAL ALT:				TCS Flooring		\$ -			
Trade Contract Identification									
3E Access Flooring									
Trade Contractor - Bid Summary									
Contractor:	Burgess								
Base Bid:	\$ 223,300								
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				Burgess		\$ 223,300.00			
TOTAL ALT:				Burgess		\$ -			
Trade Contract Identification									
10A Specialties									
Trade Contractor - Bid Summary									
Contractor:				Czarnecki					
Base Bid:				\$ 135,484					
Alt 1				\$ 1,818					
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ 1,818	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:				Czarnecki		\$ 135,483.55			
TOTAL ALT:				Czarnecki		\$ 1,817.66			

Trade Contract Identification									
10B Signage									
Trade Contractor - Bid Summary									
Contractor:					Vital Signs				
Base Bid:					\$ 25,475				
Alt 1					\$ 1,675				
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ 1,675	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
					Recommended Trade Contractor		Price		
BASE BID:					Vital Signs	\$	25,474.65		
TOTAL ALT:					Vital Signs	\$	1,675.00		
Trade Contract Identification									
10C Dispatch Consoles & Lockers									
Trade Contractor - Bid Summary									
Contractor:	Xybix Systems								
Base Bid:	\$ 468,685								
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
					Recommended Trade Contractor		Price		
BASE BID:					Xybix Systems	\$	468,685.00		
TOTAL ALT:					Xybix Systems	\$	-		
Trade Contract Identification									
10D Prefabricated Aluminum Canopy Systems									
Trade Contractor - Bid Summary									
Contractor:	Play by Design								
Base Bid:	\$ 30,300								
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
					Recommended Trade Contractor		Price		
BASE BID:					Play by Design	\$	30,300.00		
TOTAL ALT:					Play by Design	\$	-		
Trade Contract Identification									
11A Residential Appliances									
Trade Contractor - Bid Summary									
Contractor:									
Base Bid:									
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
					Recommended Trade Contractor		Price		
BASE BID:					#N/A	\$	-		
TOTAL ALT:					#N/A		#N/A		

Trade Contract Identification									
12A Window Treatments									
Trade Contractor - Bid Summary									
Contractor:	Russel Interiors	Contract Drapery	Benton						
Base Bid:	\$ 50,532	\$ 42,960	\$ 43,975						
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternas	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID:		Contract Drapery				\$ 42,960.00			
TOTAL ALT:		Contract Drapery				\$ -			
Trade Contract Identification									
13A PEMB (Supply & Install)									
Trade Contractor - Bid Summary									
Contractor:	Crossland								
Base Bid:	\$ 138,000								
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternas	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID:		Crossland				\$ 138,000.00			
TOTAL ALT:		Crossland				\$ -			
Trade Contract Identification									
21A Fire Suppression									
Trade Contractor - Bid Summary									
Contractor:					Fraizier				
Base Bid:					\$ 201,000				
Alt 1					\$ 35,600				
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternas	\$ -	\$ -	\$ -	\$ -	\$ 35,600	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID:		Fraizier				\$ 201,000.00			
TOTAL ALT:		Fraizier				\$ 35,600.00			
Trade Contract Identification									
22A Plumbing									
Trade Contractor - Bid Summary									
Contractor:		Lieber Mech.	Metropolitan	Wattie Wolfe	Waggoners	T&T Industrial	Mid-Continent		
Base Bid:		\$ 443,000	\$ 1,360,230	\$ 466,100	\$ 431,488	\$ 335,788	\$ 506,101		
Alt 1		\$ 119,000	\$ 171,200	\$ 30,600	\$ 131,200	\$ 110,000	\$ 35,350		
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternas	\$ -	\$ 119,000	\$ 171,200	\$ 30,600	\$ 131,200	\$ 110,000	\$ 35,350		
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID:		T&T Industrial				\$ 335,788.00			
TOTAL ALT:		T&T Industrial				\$ 110,000.00			

Trade Contract Identification									
23A HVAC									
Trade Contractor - Bid Summary									
Contractor:	Hunter Mech.	Lieber Mech.	Metropolitain	Wattie Wolfe	Waggoners	Mid-Continent	T&T Industrial	DeHart	Dense Mech.
Base Bid:	\$ 1,373,000	\$ 1,535,000	\$ 1,360,230	\$ 1,635,500	\$ 2,056,337	\$ 1,650,176	\$ 1,317,450	\$ 1,718,700	\$ 1,370,000
Alt 1	\$ 118,600	\$ 35,000	\$ 171,200	\$ 31,500	\$ 104,704	\$ 120,132	\$ 114,680	\$ 87,500	\$ 121,500
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ 118,600	\$ 35,000	\$ 171,200	\$ 31,500	\$ 104,704	\$ 120,132	\$ 114,680	\$ 87,500	\$ 121,500
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:						Dense Mech.			
						\$ 1,370,000.00			
TOTAL ALT:						Dense Mech.			
						\$ 121,500.00			
Trade Contract Identification									
26A Electrical									
Trade Contractor - Bid Summary									
Contractor:	Baker Bros			Prime	Delco Electric				
Base Bid:	\$ 2,036,338			\$ 1,682,230	\$ 1,825,000				
Alt 1	\$ 102,338			\$ 106,234	\$ 38,000				
Alt 2	\$ 331,328			\$ 72,586	\$ 65,000				
Alt 3	\$ 22,000			\$ 3,337	\$ 3,000				
Alt 4									
Alt 5	\$ 265,676			\$ 220,286	\$ 205,000				
Alt 6	\$ 12,380			\$ 8,631	\$ 3,000				
Alt 7									
Alt 8									
Total Alternates	\$ 795,582	\$ -	\$ -	\$ 417,734	\$ 386,000	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:						Prime			
						\$ 1,682,230.00			
TOTAL ALT:						Prime			
						\$ 417,734.00			
Trade Contract Identification									
27A Audio Visual & Telecommunications									
Trade Contractor - Bid Summary									
Contractor:		Ford AV	Prime	Trans Tel	Techico				
Base Bid:		\$ 477,082	\$ 1,198,112	\$ 1,531,868	\$ 1,304,546				
Alt 1		AV ONLY							
Alt 2		NOT VALID							
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8		\$ 8,505	\$ 3,321	\$ 5,000					
Total Alternates	\$ -	\$ 8,505	\$ 3,321	\$ 5,000	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:						Prime			
						\$ 1,198,112.00			
TOTAL ALT:						Prime			
						\$ 3,321.00			
Trade Contract Identification									
28A Fire Alarm									
Trade Contractor - Bid Summary									
Contractor:		High Tech Tronics			Stryker Integrated		Techico		
Base Bid:		\$ 25,672			\$ 18,500		\$ 27,234		
Alt 1		\$ 7,370			\$ 5,125				
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ 7,370	\$ -	\$ -	\$ 5,125	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:						Stryker Integrated			
						\$ 18,500.00			
TOTAL ALT:						Stryker Integrated			
						\$ 5,125.00			

Trade Contract Identification									
28B Access Control & Security									
Trade Contractor - Bid Summary									
Contractor:					Trans Tel				
Base Bid:					\$ 215,156				
Alt 1					\$ 5,846				
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ 5,846	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:					Trans Tel	\$	215,155.95		
TOTAL ALT:					Trans Tel	\$	5,845.70		

Trade Contract Identification									
31A Earthwork									
Trade Contractor - Bid Summary									
Contractor:	D. Owen	Timberwolf	W/W Builders	Crossland	Hammer	K&M	Hook Const.		
Base Bid:	\$ 435,000	\$ 1,370,000	\$ 368,750	\$ 394,000	\$ 291,760	\$ 504,900	\$ 465,454		
Alt 1	\$ 8,500	\$ 49,000	\$ 13,250	\$ 15,000	\$ 12,870	\$ 21,000	\$ 17,000		
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7	\$ 14,500				\$ 3,000	\$ 41,500	\$ 1,200		
Alt 8									
Total Alternates	\$ 23,000	\$ -	\$ 49,000	\$ 13,250	\$ 15,870	\$ 62,500	\$ 18,200		
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:					Hammer	\$	291,760.00		
TOTAL ALT:					Hammer	\$	15,870.00		

Trade Contract Identification									
32A Site Concrete									
Trade Contractor - Bid Summary									
Contractor:		Turning Point	Tuff	Crossland					
Base Bid:		\$ 138,900	\$ 436,000	\$ 221,000					
Alt 1									
Alt 2		\$ 1,500	\$ 1,000	\$ 4,800					
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7		\$ 3,900	\$ 48,452	\$ 5,300					
Alt 8		\$ 5,900							
Total Alternates	\$ -	\$ -	\$ 11,300	\$ 49,452	\$ 10,700	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:		Turning Point			\$	138,900.00			
TOTAL ALT:		Turning Point			\$	11,300.00			

Trade Contract Identification									
32B Asphalt									
Trade Contractor - Bid Summary									
Contractor:	Bishop Paving	Turning Point							
Base Bid:	\$ 169,400	\$ 178,300							
Alt 1									
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7	\$ 43,000	\$ 36,300							
Alt 8									
Total Alternates	\$ 43,000	\$ 36,300	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor									
BASE BID:		Turning Point			\$	178,300.00			
TOTAL ALT:		Turning Point			\$	36,300.00			

Trade Contract Identification								
32C Fencing								
Trade Contractor - Bid Summary								
Contractor:	American Fence		Superior Fence					
Base Bid:	\$ 63,000		\$ 65,331					
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6	\$ 26,000		\$ 11,396					
Alt 7								
Alt 8								
Total w/ Alt:	\$ 89,000	\$ -	\$ 77,327	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation								
Recommended Trade Contractor			Price					
BASE BID:		Superior Fence		\$	65,331.00			
TOTAL w/ ALT:		Superior Fence		\$	77,327.00			
Trade Contract Identification								
32D Landscape, Irrigation & Plantings								
Trade Contractor - Bid Summary								
Contractor:	Greenshade							
Base Bid:	\$ 158,023							
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8	\$ 21,136							
Total Alternates	\$ 21,136	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation								
Recommended Trade Contractor			Price					
BASE BID:		Greenshade		\$	158,023.00			
TOTAL ALT:		Greenshade		\$	21,136.00			
Trade Contract Identification								
33A Site Utilities								
Trade Contractor - Bid Summary								
Contractor:	Hammer		D. Owen Const.		H&H		Young Contracting	Cimmaron
Base Bid:	\$ 281,307		\$ 330,000		\$ 180,270		\$ 305,100	\$ 207,381
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation								
Recommended Trade Contractor			Price					
BASE BID:		H&H		\$	180,270.00			
TOTAL ALT:		H&H		\$	-			
Trade Contract Identification								
33B Storm Sewer Systems								
Trade Contractor - Bid Summary								
Contractor:		H&H	Timberwolf	Young Contracting	Cimmaron	Crossland	Hammer	D. Owen
Base Bid:		\$ 140,520	\$ 285,000	\$ 219,600	\$ 326,824	\$ 185,000	\$ 232,678	\$ 265,000
Alt 1								
Alt 2								
Alt 3								
Alt 4								
Alt 5								
Alt 6								
Alt 7								
Alt 8								
Total Alternates	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation								
Recommended Trade Contractor			Price					
BASE BID:		H&H		\$	140,520.00			
TOTAL ALT:		H&H		\$	-			

Trade Contract Identification									
Combination Pricing									
Trade Contractor - Bid Summary									
Contractor:	Young Contracting	H&H Plumbing	Cimmaron	Base Bid					
Scopes Include	33A + 33B	33A + 33B	33A + 33B						
Base Bid:	\$ 519,000	\$ 320,790	\$ 534,205	\$ 320,790					
Total:	\$ 519,000	\$ 320,790	\$ 534,205	\$ 320,790	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID :		H&H Plumbing				\$ 320,790.00			
Trade Contract Identification									
Combination Pricing									
Trade Contractor - Bid Summary									
Contractor:	Hammer	Base Bid							
Scopes Include	31A + 33A + 33B								
Base Bid:	\$ 801,659	\$ 612,550							
Alt 2									
Alt 3									
Alt 4									
Alt 5									
Alt 6									
Alt 7									
Alt 8									
Total:	\$ 801,659	\$ 612,550	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID :		Base Bid				\$ 612,550.00			
Trade Contract Identification									
Combination Pricing									
Trade Contractor - Bid Summary									
Contractor:	Trans-Tel	Base Bid							
Scopes Include	27A + 27B	Ford & Stryker							
Base Bid:	\$ 1,757,870	\$ 1,216,612							
Total:	\$ 1,757,870	\$ 1,216,612	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID :		Base Bid				\$ 1,216,612.00			
Trade Contract Identification									
Combination Pricing									
Trade Contractor - Bid Summary									
Contractor:	Metropolitain	Wattie Wolfe	Mid-Continent	Base Bid					
Scopes Include	22A + 23A	22A + 23A	22A + 23A	T&T + Denze					
Base Bid:	\$ 1,360,230	\$ 1,831,000	\$ 2,156,276	\$ 1,765,788					
Total:	\$ 1,360,230	\$ 1,831,000	\$ 2,156,276	\$ 1,765,788	\$ -	\$ -	\$ -	\$ -	\$ -
Crossland Construction Recommendation									
Recommended Trade Contractor				Price					
BASE BID :		Base Bid				\$ 1,765,788.00			

Project Requirements

Project Requirements

Project Duration (m)

16

Total SF

20722

ECOC

Construction Services

\$

Cost Type

Notes for Clarity

1

CM Field Office, Furniture, & Furnishing

\$ 35,438.00

PR

\$1581 @ 16 mo & \$10142

2

Office Supplier

\$ 3,200.00

PR

\$200 @ 16 mo & \$0

3

Project Sign

\$ 500.00

PR

\$500 @ 1 each & \$0

4

Superintendent Vehicle

\$ 16,000.00

PR

\$1000 @ 16 mo & \$0

4

PM Vehicle

\$ 16,000.00

PR

\$1000 @ 16 mo & \$0

5

Superintendent Fuel Expense

\$ 9,600.00

PR

\$600 @ 16 mo & \$0

5

PM Fuel Expense

\$ 9,600.00

PR

\$600 @ 16 mo & \$0

6

Jabrite Radios/Phone & Internet

\$ 9,600.00

PR

\$600 @ 16 mo & \$0

7

Copy Machine & Maintenance

\$ -

NC

No Charge

8

Computers, Usage, Software & Maintenance

\$ 1,000.00

PR

\$1,000

9

Reproduction Expense

\$ 4,000.00

PR

\$250 @ 16 mo & \$0

10

Field Office Telephone & Internet

\$ -

NC

No Charge

11

Passage & Expressage

\$ -

NC

No Charge

12

Office Janitorial

\$ -

NC

No Charge

13

Mobilization / Demobilization

\$ 8,500.00

PR

\$8500 @ 1 ea & \$0

14

Punchlist/Misc

\$ 15,600.00

PR

\$2600 @ 6 wks & \$0

15

Construction Photo's & Video's

\$ 5,600.00

PR

\$350 @ 16 mo & \$0

16

Job Meeting & Ceremony Expense

\$ -

NC

No Charge

17

Record Drawing / Closeout Manual

\$ -

NC

No Charge

18

Material Handling (Text Boring for Piers*)

\$ 12,200.00

PR

\$700 @ 16 mo & \$1000

19

Temporary Electric Service

\$ 10,361.00

Owner

\$0.5 @ 20722 sf & \$0

20

Temporary Water

\$ 3,200.00

Owner

\$200 @ 16 mo & \$0

21

Temporary Gas

\$ 6,216.60

Owner

\$0.3 @ 20722 sf & \$0

22

Temporary Construction Services: Fencing

\$ 3,000.00

PR

\$10 @ 300 lf & \$0

23

Security

\$ -

NC

No Charge

24

Temporary Toilet

\$ 4,950.00

PR

\$150 @ 2 ea per mo & \$150

24

Water/Hce

\$ 1,600.00

PR

\$100 @ 1 ea per mo & \$0

25

Temporary Tool/Storage Trailers

\$ 4,250.00

PR

\$125 @ 2 ea per mo & \$250

26

Dumpsters

\$ 20,400.00

PR

\$425 @ 3 ea per mo & \$0

27

Safety

\$ 2,072.20

PR

\$0.1 @ 20722 sf & \$0

28

Weekly Cleanup

\$ 10,400.00

PR

\$650 @ 16 mo & \$0

29

Final Cleanup

\$ 11,189.88

PR

\$0.54 @ 20722 sf & \$0

30

Meals & Lodging

\$ -

Cost of Work

31

Utility Connection Permit

\$ -

Cost of Work

32

Concrete Testing & Inspection

\$ -

Owner

33

Operational Permit

\$ -

Cost of Work

34

Testing Laboratory Services

\$ -

Owner

35

Building Permit

\$ 15,000.00

PR

36

Misc Site Repairs/Seed at Demobilization

\$ 5,000.00

PR

37

Site Survey Control Points

\$ 3,500.00

PR

\$3500 @ 1 ea & \$0

38

Dewatering

\$ 1,000.00

PR

\$100 @ 10 days & \$0

39

Temporary Heat

\$ 4,200.00

PR

\$480 @ 10 days & \$0

40

Floor Protection

\$ 1,364.98

PR

\$0.03 @ 20722 sf & \$0

Total Construction GCs & PRs

\$ 258,642.66

CROSSLAND

CONSTRUCTION COMPANY, INC.

General Conditions

General Conditions		CROSSLAND CONSTRUCTION COMPANY, INC.																		
ECOC																				
Team Members	(\$/hr)	Staff Assignments	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Total Hours	Total \$
Construction Staffing																				
TBD	\$ 115	Sr. Project Manager																	0	\$ -
TBD	\$ 100	Project Manager	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	1392	\$ 139,200.00
TBD	\$ 80	Asst. Project Manager																	0	\$ -
TBD	\$ 65	Project Engineer	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	2768	\$ 179,920.00
TBD	\$ 105	Project Superintendent	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	2768	\$ 290,640.00
TBD	\$ 85	Asst. Superintendent																	0	\$ -
TBD	\$ 70	Field Engineer	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	173	2768	\$ 193,760.00
TBD	\$ 65	Safety Inspector																	0	\$ -
Total Labor in General Conditions																			9696	\$ 803,520.00

Substantial Completion

Substantial Completion is set as July 31st, 2024. This is based on this amendment being executed within the acceptance period listed in Exhibit I.

Acceptance Period

1. Acceptance of GMP No. 1 is required on or before February 16th, 2023 (30 days from the date bids/proposals were received.)
2. Should the pricing and terms of the GMP Amendment No. 1 not be accepted prior to the above referenced date, the pricing for the scope of work included with GMP Amendment No. 1 will be null and void and the work will be re-advertised and re-bid.

File Attachments for Item:

21. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2122-75: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AND THE NORMAN MUNICIPAL AUTHORITY APPROPRIATING \$114,164 FROM THE CAPITAL OUTLAY PORTION OF THE CAPITAL FUND BALANCE TO BE USED FOR THE PURCHASE OF NEW GOLF CARTS FOR WESTWOOD GOLF COURSE.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Jason Olsen

PRESENTER: Jason Olsen, Parks and Recreation Director

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2122-75: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AND THE NORMAN MUNICIPAL AUTHORITY APPROPRIATING \$114,164 FROM THE CAPITAL OUTLAY PORTION OF THE CAPITAL FUND BALANCE TO BE USED FOR THE PURCHASE OF NEW GOLF CARTS FOR WESTWOOD GOLF COURSE.

BACKGROUND:

Westwood Golf Course is an 18-hole public golf course that opened in 1966. The Westwood Golf Course averages 35,000 rounds annually and has numerous programs, including leagues, camps, and tournaments. The Westwood Golf Course also hosts the Westwood Invitational Golf Tournament on the 4th of July every year, the largest open stroke play tournament in the State of Oklahoma.

DISCUSSION:

The Westwood Golf Course asked to replace 53 golf carts with Global Positioning Satellite (GPS) systems for fiscal year 2022-2023 (FYE23) out of the Capital Fund. The request included a plan for a 5-year lease for the golf carts. After ordering the golf carts, the lease from EZGO included a high-interest rate, with the City paying \$32,000 in interest payments over the five-year lease. City Staff has reviewed the proposal and believes it would be in the City's best interest to purchase the golf carts outright from the vendor instead of entering into a lease agreement.

The total cost for purchasing the 53 golf carts from the vendor is \$406,320.79. Westwood Golf Course would trade in 53 older golf carts worth \$150,000 in this transaction, which would decrease the purchase price of the golf carts to \$256,320.79. The Westwood Golf Course did not purchase any golf carts during FYE22, which left an available balance of \$69,650 in the capital equipment account. For FYE23, there is a capital equipment allocation of \$72,507, for a total allocation of \$142,157 available in the capital equipment account. This leaves the Westwood Golf Course needing an additional \$114,163.79 for the golf cart purchases.

With the purchase of these 53 golf carts, Westwood Golf would not need to order golf carts again for up to five years. These carts also include the lowest-end GPS that EZGO offers installed in

the golf carts. The GPS will be used only as a maintenance and theft prevention feature. The GPS does not have a display in the cart, and Westwood staff can have the golf carts automatically shut down if the carts are driven in blocked-off areas or removed from Westwood property.

RECOMMENDATION:

It is recommended that City Council and the Norman Municipal Authority approve an appropriation of \$114,163.79 from the Capital Fund Balance (Account 50-29000) to the Westwood Golf Maintenance, Other (Account 29970231-45199).

Resolution

R-2223-75

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AND THE NORMAN MUNICIPAL AUTHORITY APPROPRIATING \$114,164 FROM THE CAPITAL OUTLAY PORTION OF THE CAPITAL FUND BALANCE TO BE USED FOR THE PURCHASE OF NEW GOLF CARTS FOR WESTWOOD GOLF COURSE.

- § 1. WHEREAS, Westwood Golf Course staff is replacing 53 golf carts with GPS and received a proposal from EZGO for a 5-year lease which included a high interest rate with the City paying \$32,000 in interest payments over the five-year lease; and
- § 2. WHEREAS, City staff reviewed the proposal and believe it would be in the City's best interest to purchase the golf carts outright from the vendor instead of entering into a lease agreement with a total cost for the purchase in the amount of \$406,320.79; and
- § 3. WHEREAS, with the purchase of these 53 golf carts, Westwood Golf Course would be trading in 53 older golf carts worth \$150,000 and \$142,158 is available for this purchase.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 4. That the following appropriation be made for the reason as stated above:

<u>Account Name</u>	<u>Losing Account</u>	<u>Gaining Account</u>	<u>Amount</u>
Westwood Golf Maintenance/Other	50-29000	29970231-45199	\$114,163.79

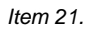
PASSED AND ADOPTED BY THE CITY COUNCIL AND THE NORMAN MUNICIPAL AUTHORITY this 14th day of February, 2023.

Mayor/Chairman

ATTEST:

City Clerk/Secretary



**INVOICE: 11841429**[illegible]



A Textron Company

Item 21.

INVOICE: 11841429

REMIT TO:
EZGO, A Textron Company
26007 Network Place
Chicago, IL 60673-1260

	City of Norman, Oklahoma DBA - Westwood Park Golf Course PO Box 370 Norman, Oklahoma				City of Norman, Oklahoma DBA - Westwood Park Golf Course 2400 Westport Rd Norman, Oklahoma		
SOLD TO:				SHIP TO:			
INVOICE NO		BR		CUSTOMER ORDER NO		SHIPPING POINT	
11841429		02		PO			
INVOICE DATE				ORDER NO	PAYMENT TERMS		
12/9/2022					Net 30		
					1/9/2023		
ITEM	QTY SHIP	PART NUMBER	DESCRIPTION			unit price	
	23		EZGO RXV ELITE			\$7,666.43	
						\$176,327.89	
						\$0.00	
						\$0.00	
	-19		2020			\$3,200.00	
						(\$60,800.00)	
						\$0.00	
						\$0.00	
						\$0.00	
	-1		Credit to account until balance of cars is delivered			\$1,365.00	
						(\$1,365.00)	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
						\$0.00	
FULL PAYMENT OF THE INVOICE AMOUNT IF DUE WITHIN 30 DAYS AFTER DATE OF INVOICE, THEREAFTER, A DEFAULT CHARGE WILL BE IMPOSED WHICH SHALL BE THE LESSER OF (A) 18% PER ANNUM OR (B) THE HIGHEST DEFAULT CHARGE ALLOWED BY LAW.						AMOUNT DUE	
						\$114,162.89	

File Attachments for Item:

22. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-95: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$11,037 FROM THE ANIMAL WELFARE DONATION ACCOUNT TO BE USED TO PURCHASE SURGICAL INSTRUMENTS AND SUPPLIES FOR THE 2023 ANIMAL WELFARE EXPO SPAY/NEUTER AND VACCINATION CLINIC.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Kellee Robertson, Manager, Animal Welfare Division

PRESENTER: Kevin Foster, Chief of Police

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-95: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$11,037 FROM THE ANIMAL WELFARE DONATION ACCOUNT TO BE USED TO PURCHASE SURGICAL INSTRUMENTS AND SUPPLIES FOR THE 2023 ANIMAL WELFARE EXPO SPAY/NEUTER AND VACCINATION CLINIC.

BACKGROUND:

The Norman Animal Welfare Center often receives general, unsolicited donations for unspecified uses. These donations are accepted and deposited within a dedicated account, where they are maintained until requested and appropriated by the City Council for use within the facility. This item is being brought forward for that purpose.

The Norman Animal Welfare Center ("Shelter"), built in 2016, has space for 92 dogs and 68 cats. Animal capacity is highly dependent upon the age of housed animals, health conditions requiring quarantine, the specific needs of animals within the facility, and staffing levels. The Shelter was over capacity for eleven (11) months in 2022 for dogs and at risk for euthanizing adoptable animals for the first time in ten (10) years. The Shelter has 57 kennels for large dogs and, at times, has had over 75 large dogs. Dogs are often housed in employee offices, intake rooms, and sally ports, or two dogs are placed in one kennel. The owner surrender list is consistently more than 125 owners.

Since 2016, Hands Helpings Paws, Inc., ("HHP") a local non-profit cat organization that focuses on Trap, Neuter, and Return (TNR) of community cats has hosted a community-wide event at the Cleveland County Fairgrounds to offer the public a variety of animal welfare experiences that focuses on education and outreach. Some of the past activities have included: informational and animal-related product booths; volunteer and foster recruitment; neonate and kitten foster care training, adoptable animals from Norman Animal Welfare; kids activities such as face painting and balloon animals; guest instructors and entertainers such as "The Kitten Lady" (Hannah Shaw) and "Moshow The Cat Rapper" and a vaccine clinic, microchipping and pet tags.

On March 25, 2023, the Animal Welfare Expo at the Cleveland County Fairgrounds will focus on a high volume spay/neuter and vaccination outreach for dogs and cats.

DISCUSSION:

The mission of the Animal Welfare Expo Spay/Neuter and Vaccination Clinic is to serve as many pets as possible to keep unwanted litters entering the City Shelter or the abandonment of animals on the streets and to provide affordable and accessible care to low-income residents and their pets. It has been statistically shown that one female/one male cat could produce 420,000 cats in seven (7) years. One female/one male dog could produce 67,000 dogs in seven years.

There are often barriers to accessible veterinary care among pet owners. Socioeconomic and financial factors are significant barriers to accessing veterinary care along with transportation challenges, not having appropriate equipment (e.g., carrier), geographic barriers, and not knowing where to get care. The event will provide services for the Norman community cats and dogs and low-income families.

Seven (7) veterinarians, ten (10) RVT/vet tech/assistants and experienced rescue volunteers are donating their medical and surgical skills and time.

HHP is currently seeking sponsorship for the event for equipment and supply needs. HHP has raised enough funds at this time to purchase two tabletop portable anesthesia with vaporizer machines and an autoclave (\$9,000) along with disposable supply items (\$3,000). HHP is expecting to receive funds to purchase an additional anesthesia with vaporizer machine (\$3,600). Other anticipated expenses are drugs for surgery (\$500), surgical instruments (75 surgical instrument packs), and administrative supplies and equipment.

On January 19, 2023, the Norman Animal Oversight Committee recommended allocating approximately \$10,000 from the Animal Welfare Donation Account for the purchase of additional surgical instruments and supplies.

RECOMMENDATION:

It is recommended that \$11,037 be appropriated from the Other/Animal Control account (10-22431) into the Animal Welfare Other Supplies/Materials-Medical account (10660270-43117) to purchase items for the 2023 Animal Expo (supply/equipment list is attached).

Resolution

R-2223-95

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$11,037 FROM THE ANIMAL WELFARE DONATION ACCOUNT TO BE USED TO PURCHASE SURGICAL INSTRUMENTS AND SUPPLIES FOR THE 2023 ANIMAL WELFARE EXPO SPAY/NEUTER AND VACCINATION CLINIC.

- § 1. WHEREAS, the Norman Animal Welfare Center often receives general, unsolicited donations for unspecified uses; and
- § 2. WHEREAS, on March 25, 2023, the Animal Welfare Expo at the Cleveland County Fairgrounds will focus on a high volume spay/neuter and vaccination outreach for dogs and cats with seven veterinarians, ten RVT/vet tech/assistants and experienced rescue volunteers donating their medical and surgical skills and time; and
- § 3. WHEREAS, on January 19, 2023, the Animal Welfare Oversight Committee recommended allocating approximately \$10,000 from the Animal Welfare Donation Account to purchase surgical instruments and supplies for the 2023 Animal Welfare Expo Spay/Neuter and Vaccination Clinic.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 4. WHEREAS, it is recommended that \$11,037 be appropriated from Other Revenues/Animal Control (10-22431) to Other Supplies, Materials-Medical (10660270-43117)

PASSED AND ADOPTED this 14th day of February, 2023.

Mayor

ATTEST:

City Clerk



S/N event items

Item	Item #	Size	Count	Item	Cost/item	Total
Vet Wrap	000.07011.2	2x5	36	1	\$38.06	\$38.06
Surgical tape	MVETAVTF100	1" 75 yd	12	1	\$17.15	\$17.15
Indicator strips	475.22201.2		250	2	\$28.64	\$57.28
Gauze	000.30008.2	4x4	200	15	\$5.49	\$82.35
Clipper blades	762.10200.2	#40	Wahl	8	\$23.51	\$188.08
3ml syringes	001.12140.2	w/22g 3/4"	100	8	\$7.04	\$56.32
1ml syringes	001.12100.2	w/25g 5/8"	100	3	\$9.97	\$29.91
Saline 1L	004.78200.3			5	\$6.26	\$31.30
LRS 1L	562.85516.3		12	1	\$68.12	\$68.12
Isoflurane	193.33165.3		250ml	8	\$33.75	\$270.00
Epinephrine	193.17556.3		50ml	1	\$28.07	\$28.07
Atropine	193.03705.3		100ml	1	\$22.07	\$22.07
Antisedan				2	\$234.85	\$469.70
Surgical Drape	000.19062.2	38"	100 yd	1	\$84.33	\$84.33
ET tubes:	3 685.01420.2			5	\$2.10	\$10.50
	3.5 685.01422.2			5	\$2.10	\$10.50
	4 685.01424.2			8	\$2.10	\$16.80
	4.5 685.01426.2			8	\$2.10	\$16.80
	5 685.01428.2			8	\$2.10	\$16.80
	5.5 685.01430.2			8	\$2.10	\$16.80
	6 685.01432.2			6	\$2.10	\$12.60
	6.5 685.01434.2			6	\$2.10	\$12.60
	7 685.01436.2			3	\$2.10	\$6.30
	7.5 685.01438.2			3	\$2.10	\$6.30
	8 685.01440.2			3	\$2.10	\$6.30
	8.5 685.01442.2			3	\$2.10	\$6.30
	9 685.01444.2			2	\$2.10	\$4.20
	10 685.01446.2			2	\$2.10	\$4.20
3M Vetbond	470.00369.4			6	\$20.19	\$121.14
3/0 Monocryl	295.52200.2		12	25	\$278.89	\$6,972.25
2/0 Monocryl	295.53205.2		12	7	\$95.21	\$666.47
0 Monocryl	295.54000.2		36	1	\$307.99	\$307.99
Instrument brushes	350.05972.2			3	\$2.25	\$6.75
Gloves:	6.5 001.09022.3			2	\$28.54	\$57.08
	7 001.09023.3			3	\$30.69	\$92.07
	8 001.09025.3			2	\$30.69	\$61.38
Sodasorb	432.40869.2	5 gal		1	\$135.00	\$135.00
FeLV/FIV tests			25	1	\$396.44	\$396.44
Convenia	885.10380.3			1	\$392.15	\$392.15
Capstar	298.30100.3			1	\$238.34	\$238.34
Total						\$11,036.80

File Attachments for Item:

23. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-96: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA APPROPRIATING \$76,250 FROM THE ROOM TAX FUND BALANCE TO BE USED BY THE NORMAN CONVENTION AND VISITORS BUREAU (NCVB) D/B/A VISITNORMAN TO PAY A PORTION OF THE COSTS FOR FOUR STRATEGIC PLANS DESIGNED TO PROMOTE TOURISM IN NORMAN.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Anthony Francisco, Finance Director

PRESENTER: Anthony Francisco, Finance Director

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-96: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA APPROPRIATING \$76,250 FROM THE ROOM TAX FUND BALANCE TO BE USED BY THE NORMAN CONVENTION AND VISITORS BUREAU (NCVB) D/B/A VISITNORMAN TO PAY A PORTION OF THE COSTS FOR FOUR STRATEGIC PLANS DESIGNED TO PROMOTE TOURISM IN NORMAN.

BACKGROUND:

Pursuant to the Norman City Code, Section 8-521 (et. Seq.), the City Council has established a policy whereby room tax collections are distributed to three organizations to further the aims of the Transient Guest (Hotel/Motel) Room Tax: the Norman Convention and Visitors Bureau, doing business as VisitNorman (50%) for convention and tourism promotion; the Parks Department for parks capital improvement projects (25%); and the Norman Arts Council (25%) for arts and humanities programs. On May 25, 1993, the Council approved contract K-9293-136 with the Norman Convention and Visitors Bureau (NCVB) d/b/a VisitNorman to administer the portion of the room tax used to attract conventions and other meetings, and to promote visitation of Norman. The contract requires that NCVB to submit to Council a detailed plan of work and integrated budget for 95% of the estimated revenues for the following fiscal year. Funds must be appropriated by Council in order to be distributed to NCVB.

As of June 30, 2023, the convention and tourism portion of the Room Tax is estimated to have a fund balance of \$246,579. Assuming that eight percent (8%) of projected allocations are held in reserve (as is the policy for most City funds), approximately \$180,579 is available in “excess” reserves for convention and tourism-related expenditures.

DISCUSSION:

As discussed in the attached letter from VisitNorman Executive Director Dan Schemm, The Board of Directors of VisitNorman has requested the appropriation of \$76,250 of available Room Tax Fund balance for strategic plans in the following areas:

- Implementation of a Weather Museum in Norman;
- Master Plan for Promotion of Tourism and Development at Lake Thunderbird;
- A Mountain Bike Trail Plan
- An Equestrian Facility Plan

VisitNorman intends to partner and share costs with the Norman Economic Development Coalition, Grover Cleveland County, and perhaps the City of Norman in the implementation of these strategic plans. The studies will include public input and Council participation, and any published outcomes will be made available to the public.

If approved, the Scope of Work for fiscal year 2022-2023 provided pursuant to Contract K-9293-136 (as last amended) shall thereafter include the work to procure and implement the strategic plans with third-party consulting firms.

RECOMMENDATION:

If Council desires to support the request of the VisitNorman Board of Directors, the appropriation of Room Tax Fund balance (account 23-29000) to Miscellaneous Services (account 23330243-44774) should be approved, and the funds directed to the Norman Convention and Visitors Bureau (VisitNorman) under an expanded scope of work for Contract K-9293-136, as amended.

Resolution

R-2223-96

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$76,250 FROM THE ROOM TAX FUND BALANCE TO BE USED BY THE NORMAN CONVENTION AND VISITOR'S BUREAU, INC., (NCVB) D/B/A VISITNORMAN TO PAY A PORTION OF THE COSTS FOR FOUR STRATEGIC PLANS DESIGNED TO PROMOTE TOURISM IN NORMAN.

- § 1. WHEREAS, pursuant to the Norman City Code, Section 8-521, the City Council has established a policy whereby room tax collections are distributed to three organizations to further the aims of the Transient Guest (Hotel/Motel) Room Tax: the Norman Convention and Visitors Bureau (50%); the Parks Department for parks capital improvement projects (25%); and the Norman Arts Council (25%); and
- § 2. WHEREAS, on May 25, 1993, the Council approved Contract K-9293-136 with the Norman Convention and Visitors Bureau, Inc., (NCVB) to administer the portion of the room tax used to attract conventions and other meetings, and to promote visitation to Norman; and
- § 3. WHEREAS, as of June 30, 2023, the convention and tourism portion of the Room Tax fund is estimated to have a balance of \$246,579, and assuming 8% of projected allocations are held in reserve, approximately \$180,579 is available in "excess" reserves for NCVB expenditures; and
- § 4. WHEREAS, NCVB has requested that \$76,250 of their reserve portion be paid to them to be used to share the cost of four strategic plans with Norman Economic Development Coalition for implementation of 1) a Weather Museum in Norman; 2) Master Plan for Promotion of Tourism and Development at Lake Thunderbird; 3) a Mountain Bike Trail Plan; and 4) an Equestrian Facility Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 5. That the following appropriation be made for reason as stated above:

Account Name	Losing Account	Gaining Account	Amount
Miscellaneous Services	23-29000	23330243-44774	\$76,250

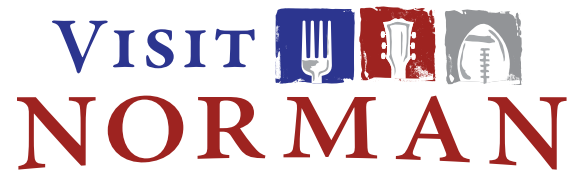
PASSED AND ADOPTED this 14th day of February, 2023.

Mayor

ATTEST:

City Clerk





January 30, 2023

Anthony Francisco, Director of Finance
City of Norman
201 W. Gray St.
Norman, OK 73069

Dear Mr. Francisco,

At our January board meeting, held Jan. 18, the VisitNorman board approved making a fund balance request for the following four strategic plans:

1. Weather museum
2. Lake Thunderbird master plan
3. Mountain bike trail plan
4. an equestrian facility plan

We are partnering with NEDC on most of these with the city and county potentially chipping in on the lake plan.

The total request from the VisitNorman fund balance to conduct these studies would be \$76,250.

Feel free to let me know what other information might be needed regarding this request.

Thank you!

Best,

Dan Schemm
VisitNorman Executive Director
dan@visitnorman.com
405-527-5382

File Attachments for Item:

24. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-97: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, APPROPRIATING \$265,777 FROM THE GENERAL FUND BALANCE TO FUND THE NET REVENUE STABILIZATION FUND (RAINY DAY FUND) AT ITS PROJECTED TARGETED LEVEL.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Anthony Francisco, Finance Director

PRESENTER: Anthony Francisco, Finance Director

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF RESOLUTION R-2223-97: A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, APPROPRIATING \$265,777 FROM THE GENERAL FUND BALANCE TO FUND THE NET REVENUE STABILIZATION FUND (RAINY DAY FUND) AT ITS PROJECTED TARGETED LEVEL.

BACKGROUND:

Pursuant to the amended Norman City Code, Section 8-103-104 (et. seq.), the City Council has established reserve policies to ensure the operations of the City of Norman's General Fund in times of extraordinary expenses or revenue shortfalls; address emergency expenditure requirements; and/or to address major, unforeseen capital facility needs. Under this requirement, the City must have, at minimum, the following reserves:

- An Operating General Fund Balance of three percent (3%) of budgeted expenditures; plus
- An Emergency Reserve Appropriation in the General Fund of at least one percent (1%) of budgeted expenditures; plus
- An additional Fund Balance in a separate Net Revenue Stabilization ("Rainy Day") Fund of four percent (4%) of budgeted expenditures.

Taken together, these minimum reserves are required to be at least eight percent (8%) of General Fund expenses. The policy further sets a TARGETED "Rainy Day" Fund balance of 5% of General Fund expenditures (bringing targeted reserves to a total of 9% of General Fund expenses). These mandated reserve levels are a "moving target", as they reflect projected or actual General Fund expenditure levels at varying points in time.

DISCUSSION:

Upon the adoption of the fiscal year 2022-2023 budget, the City had met its minimum General Fund reserve requirements. As required by the City Code, the Council, at its Finance Committee mid-year budget review meeting on January 19, 2023 received information on the actual, audited financial status of the Net Revenue Stabilization Fund, as of June 30, 2022. This updated information indicated that the Rainy Day Fund exceeded its projected Minimum required fund balance as of June 30, 2022, but was short of its projected Target fund balance. The Finance

Committee, attended by a quorum of the City Council, recommended that a deposit be made from the General Fund to the Rainy Day Fund to maintain the Net Revenue Stabilization Fund at its projected Target fund balance. The projected amount of the required deposit is \$265,777.

RECOMMENDATION:

Staff recommends that the Council Finance Committee's recommendation to appropriate \$265,777 of General Fund balance (account 10-29200) for transfer to the Net Revenue Stabilization Fund (account 11-29200) be approved.

Resolution

R-2223-97

A RESOLUTION OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, APPROPRIATING \$265,777 FROM THE GENERAL FUND BALANCE TO FUND AND MAINTAIN THE NET REVENUE STABILIZATION FUND (RAINY DAY FUND) AT ITS PROJECTED TARGETED LEVEL.

- § 1. WHEREAS, per City Code, the City Council has established reserve policies to ensure the operations of the General Fund Balance in times of extraordinary expenses or revenue shortfalls, address emergency expenditure requirements, and/or to address major, unforeseen capital facility needs; and
- § 2. WHEREAS, the City is required to have, at minimum, an operating General Fund Balance of 3% of budgeted expenditures, an emergency reserve appropriation in the General Fund of at least 1% of budgeted expenditures, and an additional Fund Balance in a separate Net Revenue Stabilization (Rainy Day) Fund of 4% of budgeted expenditures; and
- § 3. WHEREAS, the City Council Finance Committee received information on the actual, audited financial status of the Net Revenue Stabilization Fund which indicated that the Rainy Day Fund exceeded its projected minimum required fund balance but was short of its projected Target fund balance.
- § 4. WHEREAS, the City Council Finance Committee recommended that a deposit be made from the General Fund to the Rainy Day Fund to maintain the Net Revenue Stabilization Fund at its project Target fund balance.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 5. That the following appropriation be made for reason as stated above:

Account Name	Losing Account	Gaining Account	Amount
Net Revenue Stabilization Fund	10-29000	11-29200	\$265,777

PASSED AND ADOPTED this 14th day of February, 2023.

Mayor

ATTEST:

City Clerk



File Attachments for Item:

25. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-21 UPON SECOND AND FINAL READING: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE PART OF SECTION TWENTY-TWO (22), TOWNSHIP EIGHT NORTH (8N), RANGE ONE WEST (1W), OF THE INDIAN MERIDIAN, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE A-2, RURAL AGRICULTURAL DISTRICT, AND PLACE SAME IN THE PUD, PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (LOT 1 OF ROLL TOP RANCH COS-0708-5 – 10001 ETOWAH ROAD)



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Bryan and Donna Komers

PRESENTER: Jane Hudson, Director of Planning & Community Development

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-21 UPON SECOND AND FINAL READING: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE PART OF SECTION TWENTY-TWO (22), TOWNSHIP EIGHT NORTH (8N), RANGE ONE WEST (1W), OF THE INDIAN MERIDIAN, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE A-2, RURAL AGRICULTURAL DISTRICT, AND PLACE SAME IN THE PUD, PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (LOT 1 OF ROLL TOP RANCH COS-0708-5 – 10001 ETOWAH ROAD)

PROJECT OVERVIEW:

The applicant is requesting a rezoning to PUD, Planned Unit Development, at property located at 10001 Etowah Road. The site is currently vacant. On December 12, 1961, City Council adopted Ordinance No. 1322 placing this property in the A-2, Rural Agricultural District. Dirt mining is not an allowed use or Special Use in the A-2 District therefore, rezoning to a PUD, Planned Unit Development, to allow such operations in addition to uses normally allowed in the A-2, Rural Agricultural District is required.

PROCEDURAL REQUIREMENTS:

PRE-DEVELOPMENT MEETING PD 22-28, November 17, 2022

- A neighbor explained that he can see the dirt mining from his house.
- The neighbors also were curious if environmental studies had been conducted.
 - The applicant explained they had not.
- Neighbors were concerned with truck traffic and if the existing road can support the semi-trucks.
- A neighbor also requested that mining not be permitted after business hours and that a sound barrier be placed so as not to disturb his family while mining activity is occurring.

ZONING ORDINANCE CITATION:**SEC. 420 – PLANNED UNIT DEVELOPMENT**

1. Statement of Purpose. It is the intent of this section to encourage developments with a superior built environment brought about through unified development and to provide for the application of design ingenuity in such developments while protecting existing and future surrounding areas in achieving the goals of the comprehensive plan of record. The "PUD" Planned Unit Development district herein established is intended to provide for greater flexibility in the design of buildings, yards, courts, circulation, and open space than would otherwise be possible through the strict application of other district regulations. In this way, applicants may be awarded certain premiums in return for assurances of overall planning and design quality, or which will be of exceptional community benefit and which are not now required by other regulations. By permitting and encouraging the use of such procedures, the Planning Commission and City Council will be able to make more informed land use decisions and thereby guide development more effectively in the best interest of the health, safety, and welfare of the City.

Specifically, the purposes of this section are to encourage:

- (a) A maximum choice in the types of environment and living units available to the public.
- (b) Provision of more usable and suitably located open space, recreation areas, or other common facilities than would otherwise be required under conventional land development regulations.
- (c) Maximum enhancement and minimal disruption of existing natural features and amenities.
- (d) Comprehensive and innovative planning and design of diversified developments, which are consistent with the City's long range, plan and remain compatible with surrounding developments.
- (e) More efficient and economic use of land resulting in smaller networks of utilities and streets, thereby lowering costs.
- (f) Preparation of more complete and useful information, which will enable the Planning Commission and City Council to make decisions that are more informed on land use.

The PUD (Planned Unit Development) Regulations are designed to provide for small and large-scale developments incorporating a single type or a variety of residential, commercial, industrial and related uses, which are planned and developed as a unit. Such development may consist of individual lots, or it may have common building sites. Private or public common land and open space must be an essential, major element of the development, which is related to, and affects, the long-term value of the homes and other development. A Planned Unit Development shall be a separate entity with a distinct character that respects and harmonizes with surrounding development.

STAFF ANALYSIS: The particulars of this PUD include:

USE: The PUD Narrative includes the following uses:

- Commercial Dirt Mining Activities.
- Detached one family dwelling.
- Church, temple, or other place of worship.
- Public school or school offering general educational courses the same as ordinarily given in the public schools and having no rooms regularly used for housing or sleeping.
- Agricultural crops.
- The raising of farm animals.
- All of the following uses:
 - Country club.
 - Family day care home.
 - Golf course (excluding miniature golf courses).
 - Home occupation.
 - Library.
 - Park or playground.
 - Plant nursery.
 - Accessory buildings, including barns, sheds and other farm buildings, which are not part of the main building. One guest house may be utilized provided (a) it is clearly secondary to the larger main dwelling; (b) the structure is not rented or leased, nor used as a permanent dwelling; and (c) is not a mobile home.
 - Type 2 mobile home.
 - Medical Marijuana Commercial Grower, as allowed by state law.
 - Medical Marijuana Education Facility (cultivation activities only), as allowed by state law.
 - Short-term rentals.

Dirt mining activities may only be conducted between the hours of 8:00am – 8:00pm. No mining activities will occur within easement areas depicted on the Site Development Plan.

OPEN SPACE: The property will maintain a ten percent (10%) open space percentage in accordance with the City of Norman's Planned Unit Development (PUD) Ordinance. No changes to the existing open space are proposed.

SITE PLAN/ACCESS: The Site Plan is shown in Exhibit B of the PUD Narrative. The site plan shows no changes to the property. Access will continue to be off Etowah Road and will be brought up to current City standards. While no structures are shown on the proposed site plan, a single-family home would be allowed in the future. Section 22:420.5.a.3.j. (Preliminary Development Plan submittal for Planned Unit Developments) states a site plan should show "general location of structures other than single family detached units."

SIGNAGE: Signs shall comply with the sign standards of the City of Norman Sign Code as applicable to a zoning of A-2, Rural Agricultural District. The low-density residential zone sign standards would apply.

SANITATION/UTILITIES: The property does not require City sanitation services. The property will continue to have polycart services. Additional sanitation services will be approved by City sanitation services.

PARKING: The property will comply with the City's parking ordinances.

FENCING: Where installed, fencing may be barbed wire, stockade, or other material. Fencing shall otherwise comply with all City of Norman requirements. It is anticipated that the entrance to the Property will be gated.

EXISTING ZONING: The subject property is currently zoned A-2, Rural Agricultural District.

ALTERNATIVES/ISSUES:

IMPACTS: Surrounding properties include single-family homes and vacant land. Adjacent properties are zoned A-2, Rural Agricultural District. Single-family homes adjacent to the site to the south are located in the Town of Slaughterville. This PUD will not change the existing uses of the site with exception to the addition of commercial dirt mining activities. Dirt mining activities will only be conducted between the hours of 8:00am – 8:00pm per the PUD narrative. In addition, no mining will occur within any easement identified on the Site Development Plan.

OTHER AGENCY COMMENTS:

FIRE DEPARTMENT: No comments.

PUBLIC WORKS/ENGINEERING: The existing drive approach is required to be brought up to City standards.

TRAFFIC ENGINEER: The proposed access to Etowah Road affords proper sight distance to allow of safe ingress and egress to/from the site.

UTILITIES: No comments.

CONCLUSION: Staff forwards this request for rezoning from A-2, Rural Agricultural District, to PUD, Planned Unit Development, as Ordinance O-2223-21 for consideration by City Council. At their meeting of January 12, 2023, Planning Commission recommended adoption of O-2223-21 by a vote of 8-1.

O-2223-21

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, AMENDING SECTION 460 OF CHAPTER 22 OF THE CODE OF THE CITY OF NORMAN SO AS TO REMOVE PART OF SECTION TWENTY-TWO (22), TOWNSHIP EIGHT NORTH (8N), RANGE ONE WEST (1W), OF THE INDIAN MERIDIAN, TO NORMAN, CLEVELAND COUNTY, OKLAHOMA, FROM THE A-2, RURAL AGRICULTURAL DISTRICT, AND PLACE SAME IN THE PUD, PLANNED UNIT DEVELOPMENT DISTRICT; AND PROVIDING FOR THE SEVERABILITY THEREOF. (LOT 1 OF ROLL TOP RANCH COS-0708-5 LOCATED AT 10001 ETOWAH ROAD)

- § 1. WHEREAS, Bryan and Donna Komers, the owners of the hereinafter described property, have made application to have the subject property removed from the A-2, Rural Agricultural District and placed in the PUD, Planned Unit Development District; and
- § 2. WHEREAS, said application has been referred to the Planning Commission of said City and said body has, after conducting a public hearing as required by law, considered the same and recommended that the same should be granted and an ordinance adopted to effect and accomplish such rezoning; and
- § 3. WHEREAS, the City Council of the City of Norman, Oklahoma, has thereafter considered said application and has determined that said application should be granted and an ordinance adopted to effect and accomplish such rezoning.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 4. That Section 460 of Chapter 22 of the Code of the City of Norman, Oklahoma, is hereby amended so as to remove the following described property from the A-2, Rural Agricultural District and place the same in the PUD, Planned Unit Development District, to wit:

The Surface Rights Only in and to the East one-half (E/2) of the Southwest Quarter (SW/4) of Section 22, Township Eight North (8N), Range 1 West (1W), of the Indian Meridian; less and except a tract of land described as follows:

Beginning at the Southeast (SE) corner of said Southwest Quarter (SW/4), thence North 2640 feet, thence West 656.95 feet, thence South 2665.39 feet, thence East 664.86 feet to the point of beginning containing 40 acres more or less.

Ordinance O-2223-21

Page 2

Subject to all rights-of-way and easements of record and contains forty (40) acres more or less.

§ 5. Further, pursuant to the provisions of Section 22:420 of the Code of the City of Norman, as amended, the following condition is hereby attached to the zoning of the tract:

- a. The site shall be developed in accordance with the PUD Narrative, Site Development Plan, and supporting documentation, approved by the Planning Commission on January 12, 2023, and made a part hereof.

§ 6. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance.

ADOPTED this _____ day of
_____, 2023.

NOT ADOPTED this _____ day of
_____, 2023.

(Mayor)

(Mayor)

ATTEST:

(City Clerk)

KOMERS MINING DEVELOPMENT

**A PLANNED UNIT DEVELOPMENT
NORMAN, OKLAHOMA**

**APPLICANT:
*BRYAN & DONNA KOMERS***

**APPLICATION FOR:
PLANNED UNIT DEVELOPMENT**

Submitted October 31, 2022
Revised December 22, 2022

PREPARED BY:

**RIEGER LAW GROUP PLLC
136 Thompson Drive
Norman, Oklahoma 73069**

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- I. INTRODUCTION
- II. PROPERTY DESCRIPTION/GENERAL SITE CONDITIONS
 - A. Location
 - B. Existing Land Use and Zoning
 - C. Elevation and Topography
 - D. Drainage
 - E. Utility Services
 - F. Fire Protection Services
 - G. Traffic Circulation and Access
- III. DEVELOPMENT PLAN AND DESIGN CONCEPT
 - A. Uses Permitted
 - B. Development Criteria

EXHIBITS

- A. Legal Description of the Property
- B. Site Plan
- C. Allowable Uses

I. INTRODUCTION

Bryan and Donna Komers (collectively, the “**Applicant**”) intend to rezone the property that is more particularly described on **Exhibit A** (the “**Property**”) to a Planned Unit Development (“**PUD**”) in order to allow mining activities to occur on the Property in accordance with the development regulations contained in this PUD. By adding mining as an allowable use, the Applicant may serve the community by providing needed dirt and minerals to business and individual users within the surrounding community. The Property contains approximately forty (40) acres, and a site plan consisting of the existing aerial of the Property is attached hereto as **Exhibit B**. No buildings or structures are contemplated to be constructed on the Property at this time.

II. PROPERTY DESCRIPTION/GENERAL SITE CONDITIONS

A. Location

The Property is generally located along Etowah Road between 96th Avenue SE and 108th Avenue SE, with an address of 10001 Etowah Road, as is more particularly shown on the attached exhibits.

B. Existing Land Use and Zoning

The Property is currently zoned A-2, Rural Agricultural District. Additionally, the Property currently has a NORMAN 2025 designation of Country Residential. There are no structures on the Property.

C. Elevation and Topography

The Property is essentially flat with the elevation gradually sloping from the West to the East.

D. Drainage

The drainage on the Property shall remain unchanged. Stormwater and drainage will meet or exceed the City’s applicable ordinances and regulations.

E. Utility Services

No change to utility services is necessary. The Property utilizes well and septic facilities located on site, in accordance with all applicable regulations and ordinances relating thereto.

F. Fire Protection Services

No change is necessary. Fire Protection services will be provided by the City of Norman Fire Department and by the Applicant as such are required by applicable City codes, ordinances, and/or regulations.

G. Traffic Circulation and Access

No change to traffic circulation or access is requested; however, the existing drive approach will be improved to comply with the City's applicable standards.

III. DEVELOPMENT PLAN AND DESIGN CONCEPT

The Property shall be developed in compliance with the Site Development Plan, attached hereto as **Exhibit B**, subject to final design development and the changes allowed by Section 22.420(7) of the City of Norman's PUD Ordinance, as may be amended from time to time. The Exhibits attached hereto, and as submitted on behalf of the Applicant, are incorporated herein by reference and further depict the development criteria for the Property.

A. Uses Permitted:

The Property is currently zoned A-2, Rural Agricultural District. This PUD seeks to retain the existing allowable uses permissible in the Rural Agricultural District, while adding dirt mining activities as an additional allowable use. The complete list of the allowable uses for the Property is attached as **Exhibit C**. Dirt mining activities may only be conducted on the Property between the hours of 8:00am – 8:00pm. No mining activities will occur within easement areas depicted on the Site Development Plan.

B. Development Criteria:

1. Area Regulations

Front Yard: The minimum front yard shall be 50 feet or 100 feet from the center line of the public street or road, whichever distance shall be the greater.

Side Yard: The minimum side yard shall be 25 feet.

Rear Yard: The minimum rear yard shall be 50 feet.

Lot Width: The minimum width shall be 330 feet measured at the front building line.

Coverage: Main and accessory buildings shall not cover more than twenty-five percent (25%) of the lot area. Accessory buildings shall not cover more than twenty percent (20%) of the rear yard.

2. Sanitation

The Property will continue to utilize existing polycart services as the proposal does not require any additional City sanitation services. If additional sanitation services become necessary on the Property, the Applicant will work with City sanitation services to find a suitable dumpster location.

3. Signage

All signs shall comply with the sign standards of the City of Norman Sign Code as applicable to a zoning of A-2, Rural Agricultural District, and as amended from time to time.

4. Traffic access and circulation

Access to the Property shall be permitted off Etowah Road in the location that currently exists and as is depicted on the attached Site Plan. The existing drive approach will be improved to comply with the City's applicable standards.

5. Open Space

The Property shall maintain a minimum of ten percent (10%) of the Property as open space in accordance with the City of Norman's PUD Ordinance. It is noted that no buildings currently exist on the Property, and none are contemplated by this PUD.

6. Parking

The Property shall comply with Norman's applicable parking ordinances, as amended from time to time.

7. Fencing, Walls and Screening

Fencing is permissible along the perimeter of the Property, but is not required. Where installed, fencing may be barbed wire, stockade, or other material and shall otherwise comply with all City of Norman requirements, and as amended from time to time, not inconsistent with this paragraph. It is anticipated that the entrance to the Property will be gated.

EXHIBIT A

Legal Description of the Property

The Surface Rights Only in and to the East one-half (E/2) of the Southwest Quarter (SW1/4) of Section 22 (22), Township Eight North (8N), Range 1 West (1W), of the Indian Meridian; less and except a tract of land described as follows:

Beginning at the Southeast (SE) corner of said Southwest Quarter (SW1/4), thence North 2640 feet, thence West 656.95 feet, thence South 2665.39 feet, thence East 664.86 feet to the point of beginning containing 40 acres more or less.

Subject to all rights-of-way and easements of record and contains forty (40) acres more or less.

EXHIBIT B
Site Plan

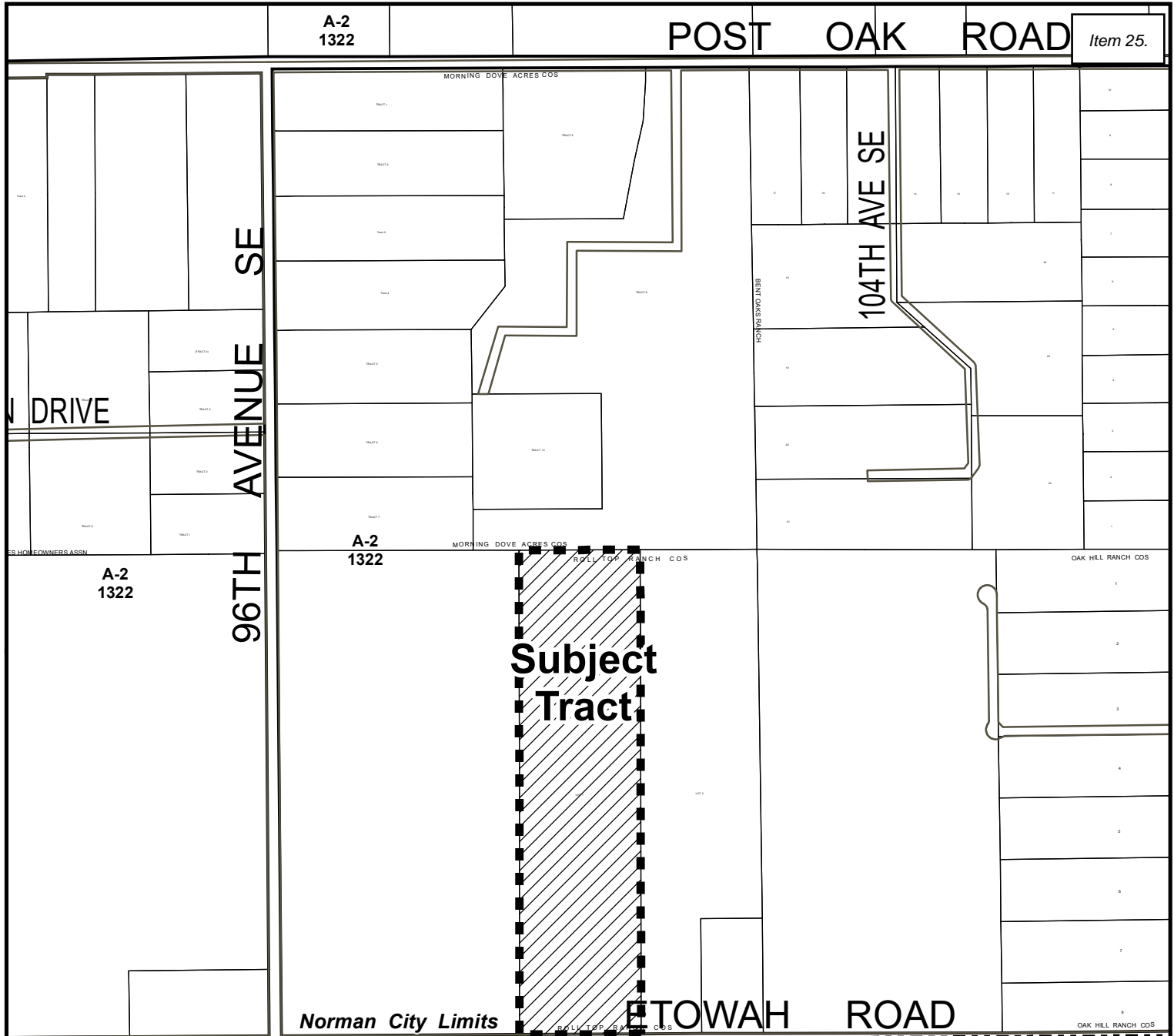
Key: Yellow Boundary Represents Property Line
Red Areas Represent Easements



EXHIBIT C
Allowable Uses

Allowable Uses:

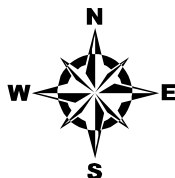
- a) Commercial Dirt Mining Activities conducted on the Property between the hours of 8:00am – 8:00pm.
- b) Detached one family dwelling.
- c) Church, temple, or other place of worship.
- d) Public school or school offering general educational courses the same as ordinarily given in the public schools and having no rooms regularly used for housing or sleeping.
- e) Agricultural crops.
- f) The raising of farm animals.
- g) All of the following uses:
 - Country club.
 - Family day care home.
 - Golf course (excluding miniature golf courses).
 - Home occupation.
 - Library.
 - Park or playground.
 - Plant nursery.
- h) Accessory buildings, including barns, sheds and other farm buildings which are not part of the main building. One guest house may be utilized provided (a) it is clearly secondary to the larger main dwelling; (b) the structure is not rented or leased, nor used as a permanent dwelling; and (c) is not a mobile home.
- i) Type 2 mobile home.
- j) Medical Marijuana Commercial Grower, as allowed by state law. (O-1920-4)
- k) Medical Marijuana Education Facility (cultivation activities only), as allowed by state law. (O-1920-4)
- l) Short-term rentals. (O-1920-56)



Location Map





Map Produced by the City of Norman
Geographic Information System.
The City of Norman assumes no
responsibility for errors or omissions
in the information presented.



October 31, 2022

0 400 800 Ft.

 Subject Tract

 Zoning

1398

Certificate of Survey

I further certify that this survey meets or exceeds the current "Oklahoma Minimum Standards for The Practice of Land Surveying" as adopted by the Oklahoma State Board of Registration For Professional Engineers and Land Surveyors.

Ronald D. Smith
Ronald D. Smith PLS 1398

State of Oklahoma
County of Cleveland

Before me, a Notary Public in and for said County and State, on this 2 day of January, 2009, personally appeared, Ronald D. Smith, to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me he executed the same as his free and voluntary act & deed.



Paula J. Lucifora
Notary Public

Accepted by The City of Norman, Oklahoma, Planning Commission on this 8th day of November, 2006

ATTEST

State of Oklahoma
County of Cleveland

Before me, a Notary Public, in and for said County and State on this 04th day of November, 2006, personally appeared, Edward R. Alsore, to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me he executed the same as his free and voluntary act and deed.

NOTARY PUBLIC
99008210
IN AND FOR
STATE OF OHIO
OFFICIAL SEAL
Ken Danner
Cleveland County
Commission Expires 6-27-2011

NORMAN CITY COUNCIL

Accepted by the City of Norman, City Council on this 18th day of December, 2007

State of Oklahoma
County of Cleveland

Before me, a Notary Public, in and for the said County and State, on this 18th day of December 2007, personally appeared, Cindy Rosenthal, to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me he executed the same as his free and voluntary act and deed.

OFFICIAL SEAL
Brenda D. Hall
Commission #0201742
Expires November 2, 2011

Brenda D. Hall

1399



I, Ronald D. Smith a Professional Land Surveyor in the State of Oklahoma, do hereby certify that this Survey Plat was prepared by me, or under my direct responsibility, supervision or checking, and that it is correct to the best of my knowledge, belief and opinion.

Ronald D. Smith PLS 1398

This Plat of Survey meets the Minimum Standards for the practice of Land Surveying as adopted by the Oklahoma State Board of Registration for Engineers and Land Surveyors.

ORDINANCE NO. O-2223-21

ITEM NO. 2

STAFF REPORT**GENERAL INFORMATION**

APPLICANT	Bryan and Donna Komers
REQUESTED ACTION	Rezoning to PUD, Planned Unit Development
EXISTING ZONING	A-2, Rural Agricultural District
SURROUNDING ZONING	North: A-2, Rural Agricultural District East: A-2, Rural Agricultural District South: Town of Slaughterville West: A-2, Rural Agricultural District
LOCATION	10001 Etowah Road
WARD	5
CORE AREA	No
AREA/SF	40 acres, more or less
PURPOSE	Allow for dirt mining operations in addition to uses normally allowed in the A-2, Rural Agricultural District
EXISTING LAND USE	Vacant
SURROUNDING LAND USE	North: Single-family residential East: Vacant South: Single-family residential West: Vacant
LAND USE PLAN DESIGNATION	Country Residential
GROWTH AREA DESIGNATION	Country Residential Area

PROJECT OVERVIEW: The applicant is requesting a rezoning to PUD, Planned Unit Development, at property located at 10001 Etowah Road. The site is currently vacant. On December 12, 1961, City Council adopted Ordinance No. 1322 placing this property in the A-2, Rural Agricultural District. Dirt-mining is not an allowed use or Special Use in the A-2 District

therefore, rezoning to a PUD, Planned Unit Development, to allow such operations in accordance with the uses normally allowed in the A-2, Rural Agricultural District is required.

PROCEDURAL REQUIREMENTS:

PRE-DEVELOPMENT MEETING: PD 22-28, November 17, 2022

A neighbor explained that he can see the dirt mining from his house.

The neighbors also were curious if environmental studies had been conducted.

The applicant explained they had not.

Neighbors were concerned with truck traffic and if the existing road can support the semi-trucks.

A neighbor also requested that mining not be permitted after business hours and that a sound barrier be placed so as not to disturb his family while mining activity is occurring.

ZONING ORDINANCE CITATION:

SEC. 420 – PLANNED UNIT DEVELOPMENT

1. Statement of Purpose. It is the intent of this section to encourage developments with a superior built environment brought about through unified development and to provide for the application of design ingenuity in such developments while protecting existing and future surrounding areas in achieving the goals of the comprehensive plan of record. The "PUD" Planned Unit Development district herein established is intended to provide for greater flexibility in the design of buildings, yards, courts, circulation, and open space than would otherwise be possible through the strict application of other district regulations. In this way, applicants may be awarded certain premiums in return for assurances of overall planning and design quality, or which will be of exceptional community benefit and which are not now required by other regulations. By permitting and encouraging the use of such procedures, the Planning Commission and City Council will be able to make more informed land use decisions and thereby guide development more effectively in the best interest of the health, safety, and welfare of the City.

Specifically, the purposes of this section are to encourage:

- (a) A maximum choice in the types of environment and living units available to the public.
- (b) Provision of more usable and suitably located open space, recreation areas, or other common facilities than would otherwise be required under conventional land development regulations.
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- (e) More efficient and economic use of land resulting in smaller networks of utilities and streets, thereby lowering costs.
- (f) Preparation of more complete and useful information which will enable the Planning Commission and City Council to make more informed decisions on land use.

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scale developments incorporating a single type or a variety of residential, commercial, industrial and related uses which are planned and developed as a unit. Such development may consist of individual lots, or it may have common building sites. Private or public common land and open space must be an essential, major element of the development which is related to, and affects, the long term value of the homes and other development. A Planned Unit Development shall be a separate entity with a distinct character that respects and harmonizes with surrounding development.

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USE: The PUD Narrative includes the following uses:

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- Public school or school offering general educational courses the same as ordinarily given in the public schools and having no rooms regularly used for housing or sleeping.
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- The raising of farm animals.
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 - Family day care home.
 - Golf course (excluding miniature golf courses).
 - Home occupation.
 - Library.
 - Park or playground.
 - Plant nursery.
- Accessory buildings, including barns, sheds and other farm buildings which are not part of the main building. One guest house may be utilized provided (a) it is clearly secondary to the larger main dwelling; (b) the structure is not rented or leased, nor used as a permanent dwelling; and (c) is not a mobile home.
- Type 2 mobile home.
- Medical Marijuana Commercial Grower, as allowed by state law.
- Medical Marijuana Education Facility (cultivation activities only), as allowed by state law.
- Short-term rentals.

Dirt mining activities may only be conducted between the hours of 8:00am – 8:00pm. No mining activities will occur within easement areas depicted on the Site Development Plan.

OPEN SPACE: The property will maintain a ten percent (10%) open space percentage in accordance with the City of Norman's Planned Unit Development (PUD) Ordinance. No changes to the existing open space are proposed.

SITE PLAN/ACCESS: The Site Plan is shown in Exhibit B of the PUD Narrative. The site plan shows no changes to the property. Access will continue to be off Etowah Road and will be brought up to current City standards. While no structures are shown on the proposed site plan, a single-family home would be allowed in the future. Section 22:420.5.a.3.j. (Preliminary Development Plan submittal for Planned Unit Developments) states a site plan should show "general location of structures other than single family detached units."

SIGNAGE: Signs shall comply with the sign standards of the City of Norman Sign Code applicable to a zoning of A-2, Rural Agricultural District. The low-density residential zone sign standards would apply.

SANITATION/UTILITIES: The property does not require City sanitation services. The property will continue to have polycart services. Additional sanitation services will be approved by City sanitation services.

PARKING: The property will comply with the City's parking ordinances.

FENCING: Where installed, fencing may be barbed wire, stockade, or other material. Fencing shall otherwise comply with all City of Norman requirements. It is anticipated that the entrance to the Property will be gated.

EXISTING ZONING: The subject property is currently zoned A-2, Rural Agricultural District.

ALTERNATIVES/ISSUES:

IMPACTS: Surrounding properties include single-family homes and vacant land. Adjacent properties are zoned A-2, Rural Agricultural District. Single-family homes adjacent to the site to the south are located in the Town of Slaughterville. This PUD will not change the existing uses of the site with exception to the addition of commercial dirt mining activities. Dirt mining activities will only be conducted between the hours of 8:00am – 8:00pm per the PUD narrative. In addition, no mining will occur within any easement identified on the Site Development Plan.

OTHER AGENCY COMMENTS:

FIRE DEPARTMENT: No comments.

PUBLIC WORKS/ENGINEERING: The existing drive approach is required to be brought up to City standards.

TRAFFIC ENGINEER: The proposed access to Etowah Road affords proper sight distance to allow of safe ingress and egress to/from the site.

UTILITIES: No comments.

CONCLUSION: Staff forwards this request for rezoning from A-2, Rural Agricultural District, to PUD, Planned Unit Development, as Ordinance No. O-2223-21 for consideration by the Planning Commission and a recommendation to City Council.



CITY OF NORMAN, OK PLANNING COMMISSION MEETING

Municipal Building, Council Chambers, 201 West Gray, Norman, OK 73069
Thursday, January 12, 2023 at 6:30 PM

MINUTES

The Planning Commission of the City of Norman, Cleveland County, State of Oklahoma, met in Regular Session in Council Chambers of the Norman Municipal Building, 201 West Gray Street, on the 12th day of January, 2023.

Notice and agenda of the meeting were posted at the Norman Municipal Building and online at <https://norman-ok.municodemeetings.com> at least twenty-four hours prior to the beginning of the meeting.

Chair Erica Bird called the meeting to order at 6:30 p.m.

ROLL CALL

PRESENT

Cameron Brewer
Kevan Parker
Liz McKown
Steven McDaniel
Erica Bird
Douglas McClure
Jim Griffith
Maria Kindel
Michael Jablonski

A quorum was present.

STAFF MEMBERS PRESENT

Jane Hudson, Director, Planning & Community Development
Lora Hoggatt, Planning Services Manager
Colton Wayman, Planner I
Beth Muckala, Assistant City Attorney
Todd McLellan, Development Engineer
Roné Tromble, Recording Secretary
Mitchell Richardson, Multimedia Supervisor

1. Election of Officers

Motion made by Steven McDaniel to nominate Erica Bird as Chair, Kevan Parker as Vice Chair, and Michael Jablonski as Secretary; seconded by Liz McKown.

Voting Yea: Brewer, Parker, McKown, McDaniel, Bird, McClure, Griffith, Kindel, Jablonski

Planned Unit Development

3. Consideration of Approval, Acceptance, Rejection, Amendment, and/or Postponement of Ordinance No. O-2223-21: Bryan and Donna Komers request rezoning from A-2, Rural Agricultural District, to PUD, Planned Unit Development, to allow for mining activities for approximately 40 acres of property generally located on the north side of Etowah Road between 96th Avenue S.E. and 108th Avenue S.E.

ITEMS SUBMITTED FOR THE RECORD:

1. Location Map
2. Staff Report
3. Komers Mining Development PUD Narrative with Exhibits A-C
4. Roll Top Ranch Certificate of Survey

PRESENTATION BY STAFF: Mr. Wayman reviewed the staff report, a copy of which is filed with the minutes.

Mr. Jablonski asked what zoning category dirt mining would fall under, and whether there have been any other special requests like this. Mr. Wayman responded that dirt mining is not an allowed use in any zoning district. Ms. Hudson responded that there was an amendment to the Founders Park PUD to allow dirt mining several years ago.

Mr. Jablonski asked about sand mining on the west side of town. Ms. Bird responded the sand mining is outside the City limits of Norman to the west.

PRESENTATION BY THE APPLICANT: Gunner Joyce, Rieger Law Group, representing the applicant, presented the project.

Ms. McKown asked about the hours of operation to 8 PM. Mr. Joyce responded.

Mr. Brewer asked how long the mining activity might be expected to last. Mr. Joyce responded.

AUDIENCE PARTICIPATION:

Cheryl Blake, Fischer Road, spoke regarding her concerns with the proposed project.

Mr. Griffith asked about the extent of the mining: how much of the open area will be mined and how much of the forested area. Mr. Joyce responded that the applicants have a Department of Mines permit for 5 acres that does not go into the trees. There is a 62.5' buffer from the road.

Mr. Griffith asked about cattle grazing. Mr. Joyce responded that they currently use this 40 acres and the 40 acres to the east.

Mr. Parker asked what is required to build a farm pond. Ms. Hudson and Mr. McLellan responded.

Ms. Kindel asked about the elevation and drainage questions that were raised. Mr. Joyce responded.

Ms. Bird asked about the easements on the site plan. Mr. Joyce responded that one is an oil/gas pipeline and one is a utility easement.

Mr. Jablonski asked if there are requirements with regard to water quality in the pond. Mr. Joyce did not have the answer. They had to do a reclamation plan for the surrounding impacted area.

DISCUSSION AND ACTION BY THE PLANNING COMMISSION:

Mr. Parker asked that the Commission consider the precedent this may set.

Mr. Jablonski commented he thinks it is smart to take something that would be waste and sell it.

Motion made by Steven McDaniel to recommend adoption of Ordinance No. O-2223-21 to City Council; seconded by Michael Jablonski.

Voting Yea: Brewer, McKown, McDaniel, Bird, McClure, Griffith, Kindel, Jablonski

Voting Nay: Parker

The motion to recommend adoption of Ordinance No. O-2223-21 to City Council passed by a vote of 8-1.

File Attachments for Item:

26. CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-24 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING AND ENACTING A NEW CODE FOR THE CITY; PROVIDING FOR THE REPEAL OF CERTAIN ORDINANCES NOT INCLUDED THEREIN; PROVIDING A PENALTY FOR THE VIOLATION THEREOF; PROVIDING FOR THE MANNER OF AMENDING SUCH CODE; AND PROVIDING WHEN SUCH CODE AND THIS ORDINANCE SHALL BECOME EFFECTIVE; AND PROVIDING FOR THE SEVERABILITY THEREOF.



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 01/24/2023

REQUESTER: Jeanne Snider, Assistant City Attorney

PRESENTER: Brenda Hall, City Clerk

ITEM TITLE: CONSIDERATION OF ADOPTION, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF ORDINANCE O-2223-24 UPON FIRST READING BY TITLE: AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING AND ENACTING A NEW CODE FOR THE CITY; PROVIDING FOR THE REPEAL OF CERTAIN ORDINANCES NOT INCLUDED THEREIN; PROVIDING A PENALTY FOR THE VIOLATION THEREOF; PROVIDING FOR THE MANNER OF AMENDING SUCH CODE; AND PROVIDING WHEN SUCH CODE AND THIS ORDINANCE SHALL BECOME EFFECTIVE; AND PROVIDING FOR THE SEVERABILITY THEREOF.

BACKGROUND: Codification or Recodification is the process of consolidating and organizing the city code into a logical and sequential code of ordinances.

Title 11 § 14-108 of the Oklahoma Statutes states the governing body of a municipality may, from time to time, authorize a codification of its ordinances. The ordinances and parts of ordinances included in the code may be revised, rearranged, renumbered and reorganized into some systematic arrangement.

Section 14-109 of Title 11 states the penal ordinance of every municipality shall be compiled and published in a permanent form, either printed or typed, periodically, but not less than once each ten (10) years. The ten (10) year codification requirement is satisfied if the code complies with the compilation requirement and the biennial supplements are made a part of the permanent volume, which are maintained in permanent form either bound or in a loose-leaf form.

The City of Norman has utilized a loose-leaf supplement system since 1976 and, therefore, has not been required to recodification every ten (10) years. However, recodification of the code does provide an opportunity to review the code as a whole and ensure it is current and sufficiently organized.

DISCUSSION: The City began the process of recodification in the fall of 2020 after funds were included in the FYE2021 budget. Online access to the Norman City Code is currently provided by Municode, an industry leader in search application for over 3300 codes nationwide. Municode is a source for custom government websites, self-service publication, meetings and agenda management and more.

The City partnered with Municode, who has a team of experienced attorneys who worked with the City step-by-step to ensure that the code was legally sufficient, modern and quickly connects with our citizens. There was a comprehensive review of all materials. Each ordinance was examined to determine whether it should be included in the code and a digital conversion of all materials were formatted as to styling and numbering. Photographs, maps, diagrams, charts and tables were integrated in the revision.

Attorneys with Municode conducted a legal review of the materials to identify conflicts, inconsistencies, obsolete ordinances and comparison to the Oklahoma Statutes. Department heads or their designees were provided a copy of the initial draft for review for their pertinent provisions. Through a number of telephone conferences and emails, staff reviewed and discussed the recommendations from Municode.

Substantive code provisions still in effect did not change. One of the best changes is the addition of the Zoning Code to the Norman City Code allowing staff, residents, and council members to have easy access to the Zoning Code. All the code section numbers have changed which will be a learning curve for staff and requiring forms, signs and other documents to be updated. Code provisions that were removed due to obsolence include provisions relating to the Children's Rights Coordinating Commission, expired sales tax, COVID-19 Pandemic, self-service fueling stations, childcare establishments, and cable television of the Norman Code were deleted during the process and will be repealed. Due to an Oklahoma City ordinance regarding panhandling being overturned in Federal court, the begging ordinance was deleted. Chapters are available for future revisions and additions to the code. All in all, the code will be more user friendly and easier to research. The recodified Norman City Code can be found at <https://norman.municipalcodeonline.com/book?type=ordinances>.

RECOMMENDATION: The recommendation for recodification of the Norman City Code are being forwarded to Council for consideration at this time.

O-2223-23

ORDINANCE O-2223-23

AN ORDINANCE OF THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA, ADOPTING AND ENACTING A NEW CODE FOR THE CITY; PROVIDING FOR THE REPEAL OF CERTAIN ORDINANCES NOT INCLUDED THEREIN; PROVIDING A PENALTY FOR THE VIOLATION THEREOF; PROVIDING FOR THE MANNER OF AMENDING SUCH CODE; AND PROVIDING WHEN SUCH CODE AND THIS ORDINANCE SHALL BECOME EFFECTIVE; AND PROVIDING FOR THE SEVERABILITY THEREOF.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF NORMAN, OKLAHOMA:

- § 1. THAT the Code entitled "Code of the City of Norman, Oklahoma," published by Municipal Code Corporation, consisting of chapters 1 through 36, each inclusive, is adopted.
- § 2. THAT all ordinances of a general and permanent nature enacted on or before December 14, 2022, and not included in the Code or recognized and continued in force by reference therein, are repealed.
- § 3. THAT the repeal provided for in section 2 hereof shall not be construed to revive any ordinance or part thereof that has been repealed by a subsequent ordinance that is repealed by this ordinance.
- § 4. THAT unless another penalty is expressly provided, every person convicted of a violation of any provision of the Code or any ordinance, rule or regulation adopted or issued in pursuance thereof shall be punished by a fine in the maximum amount allowed by state law. Each act of violation and each day upon which any such violation shall continue or occur shall constitute a separate offense. The penalty provided by this section, unless another penalty is expressly provided, shall apply to the amendment of any Code section, whether or not such penalty is reenacted in the amendatory ordinance. In addition to the penalty prescribed above, the city may pursue other remedies such as abatement of nuisances, injunctive relief and revocation of licenses or permits.
- § 5. THAT additions or amendments to the Code when passed in such form as to indicate the intention of the city to make the same a part of the Code shall be deemed to be incorporated in the Code, so that reference to the Code includes the additions and amendments.

O-2223-23

- § 6. THAT ordinances adopted after December 14, 2022, that amend or refer to ordinances that have been codified in the Code shall be construed as if they amend or refer to like provisions of the Code.
- § 7. THAT this ordinance shall become effective March 16, 2023.
- § 8. Severability. If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance, except that the effective date provision shall not be severable from the operative provisions of the ordinance.

ADOPTED this day

of _____, 2023.

Larry Heikkila, Mayor

NOT ADOPTED this day

of _____, 2023.

ATTEST:

Brenda Hall, City Clerk

File Attachments for Item:

27. CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A REQUEST TO RETURN A CASH SURETY FOR DEFERRED CONSTRUCTION FOR PAVING IMPROVEMENTS IN CONNECTION WITH FOUNTAIN VIEW ADDITION, SECTION 1. (GENERALLY LOCATED ¼ MILE SOUTH OF WEST TECUMSEH ROAD ON THE EAST SIDE OF 48TH AVENUE NW).



CITY OF NORMAN, OK STAFF REPORT

MEETING DATE: 02/14/2023

REQUESTER: Ken Danner, Subdivision Development Manager

PRESENTER: Shawn O'Leary, Director of Public Works

TITLE: CONSIDERATION OF APPROVAL, ACCEPTANCE, REJECTION, AMENDMENT, AND/OR POSTPONEMENT OF A REQUEST TO RETURN A CASH SURETY FOR DEFERRED CONSTRUCTION FOR PAVING IMPROVEMENTS IN CONNECTION WITH FOUNTAIN VIEW ADDITION, SECTION 1. (GENERALLY LOCATED ¼ MILE SOUTH OF WEST TECUMSEH ROAD ON THE EAST SIDE OF 48TH AVENUE NW).

BACKGROUND:

City Council, at its meeting of August 14, 2012, approved deferred construction for paving improvements in connection with Fountain View Addition, Section 1 (generally located ¼ mile south of West Tecumseh Road on the east side of 48th Avenue N.W.) subject to receipt of payment in cash or certificate of deposit. The owners submitted Certificate of Deposit No. 55833 to City Staff in the amount of \$52,640. The final plat for Fountain view Addition, Section 1 dedicated 48th Avenue N.W. right-of-way and the final plat was filed of record with the Cleveland County Clerk on August 29, 2012. Fountain View Addition, Section 1 is a single-family residential development of 87 lots with street access to 48th Avenue N.W.

DISCUSSION:

Mr. Sean Rieger, attorney for the owner has requested that the City release the obligation and return the cash surety for the deferred construction for paving improvements based on the fact it has been held for over ten (10) years. Section 19-602 B7 of the Code of the City of Norman states that *"If construction of the deferred facility has not commenced within ten (10) years from the date of deferment, then the cost paid or the certificate of deposit may be returned upon action of the Council upon written request of the payor."* Because more than ten (10) years have passed since submittal of the deferred construction payment, the owner has now requested that the City release the obligation and return the cash surety.

It should be noted, on April 2, 2019, Norman voters approved the City's 2019 Transportation Bond Program including major improvements to 48th Avenue N.W. from Rock Creek Road to Tecumseh Road. The 48th Avenue N.W. Paving Project is scheduled for construction in 2029 at an estimated cost of \$8,096,113 million including design, utility relocation and construction. City Bond funds will be matched with federal funds and local development fees to pay the project costs.

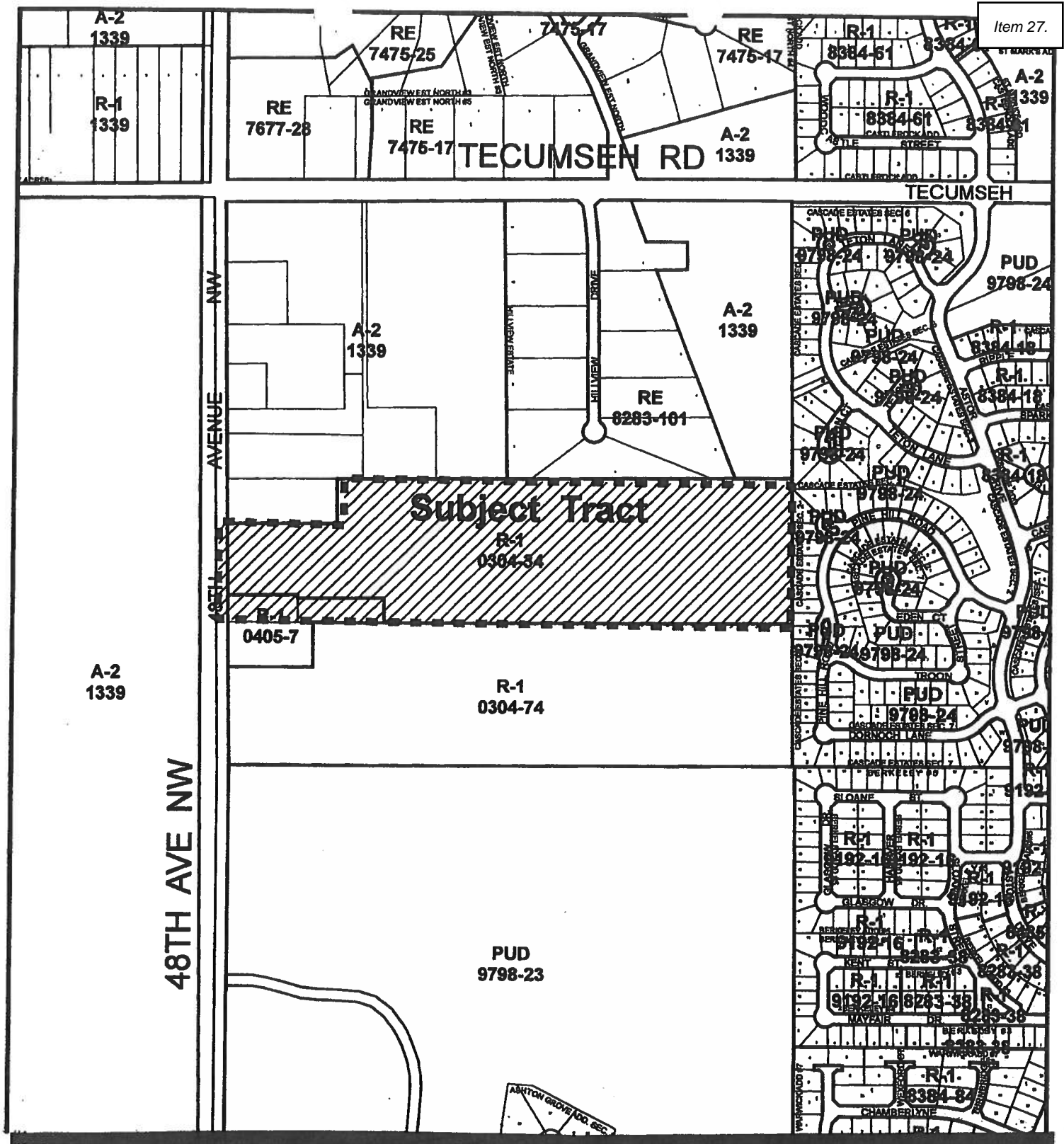
STAFF RECOMMENDATION:

City staff has concluded the following options are available to the City Council regarding this matter:

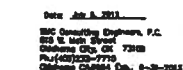
1. Release the cash surety. If the cash surety is released, the City will likely install the paving improvements at a future date at the City's cost. There is no mechanism available to the City to require a future owner or developer to install the improvements.
2. Require the developer to construct the street improvements in connection with 48th Avenue N.W.
3. Retain the cash surety until 2029 when improvements to 48th Avenue NW are completed.

As a result of the 2019 Transportation Bond Election, there is now a future paving project for 48th Avenue N.W. Fountain View Addition should contribute to the local share of the project.

Staff recommends Option Number 3, retaining the cash surety.



- FOUNTAIN VIEW ADDITION, SECTION 1



Sean Paul Rieger
Daniel L. Sadler
Gunner B. Joyce



Keith A. Barrett
Libby A. Smith
Joe P. Krodel

5 December 2022

City of Norman
City Council
201 West Gray
Norman, OK 73069

Re: Request for the Return of Certificate of Deposit for Deferred Improvements

We submit the following request for the return of a certificate of deposit, in the amount of Fifty-Two Thousand Six Hundred Forty Dollars (\$52,640.00) (the “**Deposit**”), on behalf of our client SKS1, L.L.C., an Oklahoma limited liability company (“**SKS1**”). During the final platting process for Fountain View Addition Section 1, SKS1 paid the Deposit to the City of Norman (the “**City**”) for deferred public improvement construction costs in accordance with City of Norman Code of Ordinances (the “**Code**”) Section 19-602B. As the Deposit has now been held by the City for more than ten (10) years, and construction on the planned public improvements has not commenced, SKS1 requests that the City Council release the Deposit back to SKS1.

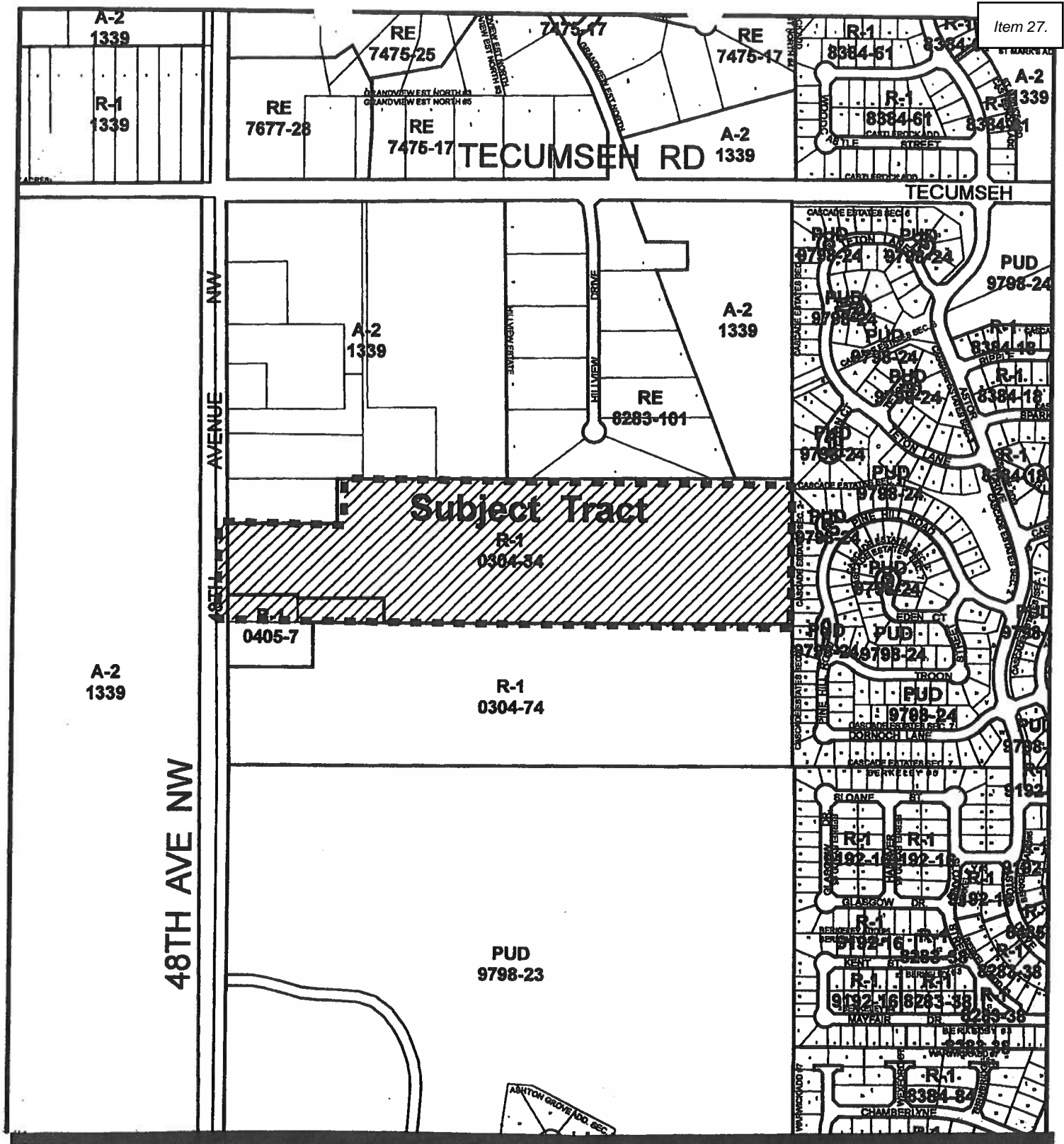
Section 19-602 of the Code provides a procedure for the deferral of the construction of public improvements that are required by the Code at the time of acceptance of a final plat within a subdivision. On August 20, 2012, the City Council accepted the Deposit from SKS1 in order to later widen 48th Avenue NW. The amount of Fifty-Two Thousand Six Hundred Forty Dollars (\$52,640.00) was based on an engineer’s estimate of the cost to complete the project, which is attached hereto as **EXHIBIT A**. The City accepted the Final Plat for Fountain View Addition Section 1 on August 23, 2012, and the Plat was filed in the office of the Cleveland County Clerk on August 29, 2012. However, construction to widen 48th Avenue NW has never commenced.

Section 19-602B.7 of the Code provides that “[i]f construction of the deferred facility has not commenced within ten (10) years from the date of deferment, then the cost paid or the certificate of deposit may be returned upon action of the Council upon written request of the payor.” As ten (10) years have passed since the date of deferment and construction on 48th Avenue NW has not commenced, this letter serves as our client’s official request to the City Council for the return of the Deposit. Please feel free to reach out with any questions that you may have with this request.

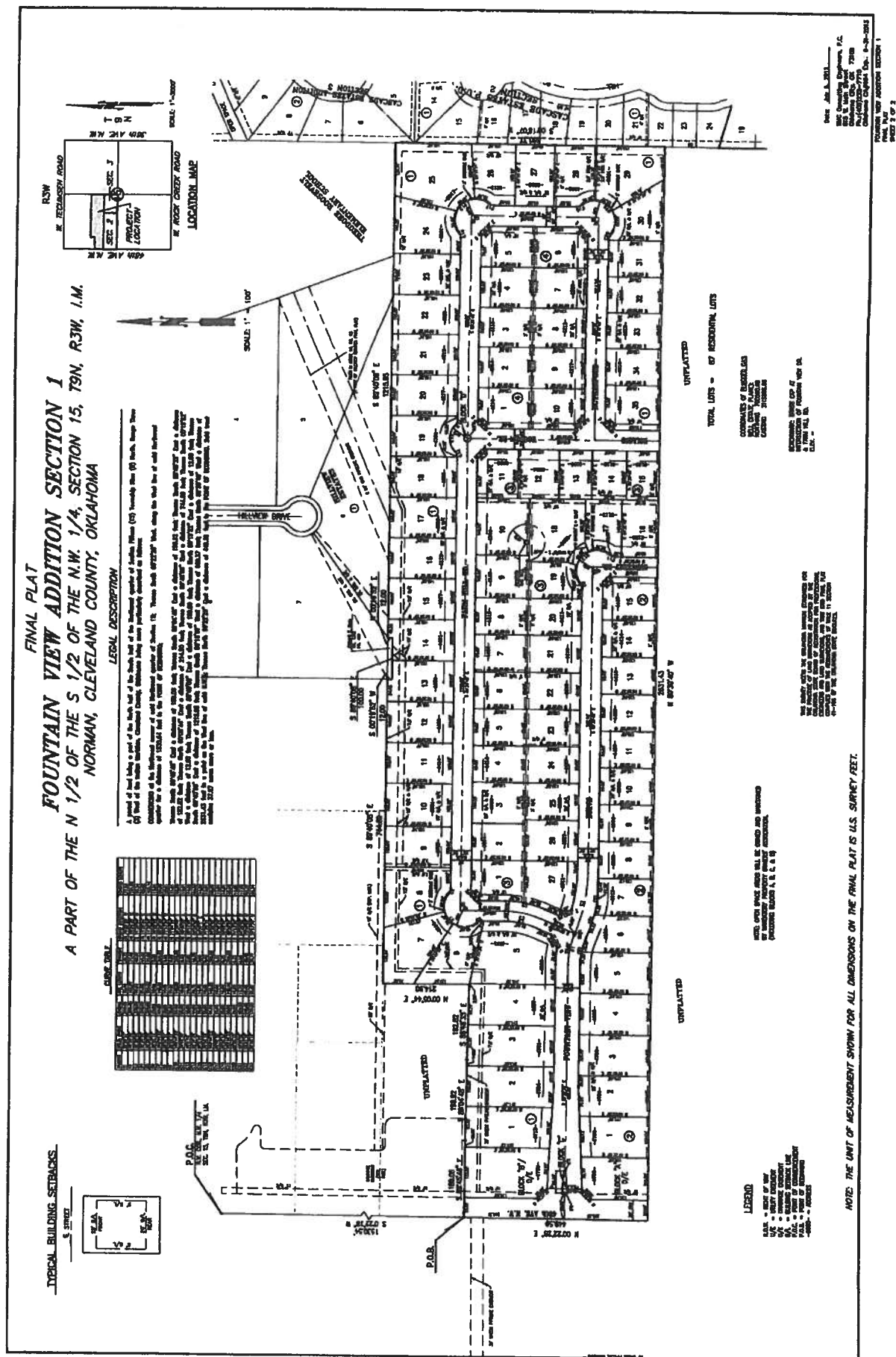
Sincerely,
RIEGER LAW GROUP, PLLC

A handwritten signature in black ink, appearing to read 'Sean Paul Rieger'.

Sean Paul Rieger
Attorney at Law – Architect - Broker



- FOUNTAIN VIEW ADDITION, SECTION 1



Sean Paul Rieger
Daniel L. Sadler
Gunner B. Joyce



Keith A. Barrett
Libby A. Smith
Joe P. Krodel

5 December 2022

City of Norman
City Council
201 West Gray
Norman, OK 73069

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Sincerely,
RIEGER LAW GROUP, PLLC

A handwritten signature in black ink, appearing to read 'Sean Paul Rieger'.

Sean Paul Rieger
Attorney at Law – Architect - Broker

Date

Opened: AUGUST 20, 2012

NORMAN 12 MONTH CD

Certificate Number: 55833Account Number: 55833SSN/TIN Number: 731-67-3945

Certificate of Deposit

Amount of

Deposit: Fifty two thousand six hundred forty & no/100 \$ 52,640.00

This Certificate is Issued to:

Issuer:

SKS1 LLC
AND CITY OF NORMAN
ATTN: FINANCE DIRECTOR
221 48TH AVE NW
NORMAN OK 73072

First Bank & Trust Co.
PO Box 721450
Norman, OK 73070

By

Debbie C Eddy
DEBBIE C EDDY

Not Negotiable - Not Transferable.

This account is subject to all the terms and conditions stated in the Certificate of Deposit Disclosures, as they may be amended from time to time, and incorporates the Certificate of Deposit Disclosures by reference into this agreement.

This certificate may be redeemed on 08/20/13 only upon presentation of the certificate to the Financial Institution.

The interest rate of this certificate of deposit is .35 % with an annual percentage yield of .35 %.

The rate on this certificate is ☒ fixed ☐ variable. The interest will be:

☒ added to principal

☐ paid to _____ account (No. _____)

☐ mailed to the owner(s)

☒ Interest will be paid monthly

Endorsements - Sign only when you request withdrawal.

X _____

X Pat _____

Pat - owner

EXHIBIT A**SMC**

Your Civil Engineering Solution

Consulting Engineers, P.C.
815 West Main
Oklahoma City, OK 73106
405-232-7715
FAX 405-232-7859
www.smcok.com

Civil Engineering
Land Development
Storm Water Management

Tom L. McCaleb
Terence L. Haynes
Christopher D. Anderson
Ole M. Marcussen

July 10, 2012

Mr. Todd McLellan, P.E.
Development Engineer
City of Norman
P.O. Box 370
Norman, OK 73070

Re: 48th Avenue NW deferred cost
Fountain View Addition Section 1
Norman, Oklahoma
SMC No. 5133.00

Dear Mr. McLellan:

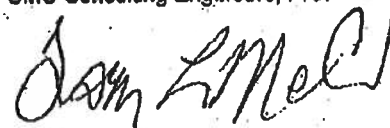
The deferred cost for 48th Avenue NW for Fountain View Addition Section 1 is as follows:

ITEM NO.	DESCRIPTION	UNIT	QUANTITY	COST/UNIT	COST
100	6" Curb and Gutter	L.F.	312.00	\$10.00	\$3,120.00
101	2" Type "S5" Asphaltic Concrete	S.Y.	925.00	\$12.50	\$11,562.50
102	4" Type "S3" Asphaltic Concrete	S.Y.	776.00	\$17.50	\$13,580.00
103	3" Type "S3" Asphaltic Concrete	S.Y.	933.00	\$15.00	\$13,995.00
104	6" Modified Subgrade (14% CKD)	S.Y.	933.00	\$5.00	\$4,665.00
105	Remove Existing Pavement	S.Y.	1147.00	\$5.00	\$5,735.00
				Total	\$52,640.00

If you have any questions, please call.

Sincerely,

SMC Consulting Engineers, P.C.



Tom L. McCaleb, P.E.

cc: Sassan Moghadam
file

Item 33, being:

CONSIDERATION OF A FINAL PLAT FOR FOUNTAIN VIEW ADDITION, SECTION 1, ACCEPTANCE OF PUBLIC DEDICATIONS CONTAINED THEREIN, AND DEFERRAL OF STREET IMPROVEMENTS FOR 48TH AVENUE N.W. (GENERALLY LOCATED ON THE EAST SIDE OF 48TH AVENUE N.W. SOUTH OF WEST TECUMSEH ROAD)

Councilmember Griffith moved that the final plat for Fountain View Addition, Section 1, and the deferral of paving improvements for 48th Avenue N.W., be approved; the public dedications contained within the plat be accepted; the Mayor be authorized to sign the final plat and subdivision and maintenance bonds subject to the City Development Committee's acceptance of all required public improvements and receipt of a fee in the amount of \$62,640 for deferral of street improvements for 48th Avenue N.W., within ten 10 days after approval; and the filing of the final plat be directed, which motion was duly seconded by Councilmember Kovach;

Items submitted for the record

1. Text File No. FP-0910-16 dated June 1, 2012, by Ken Danner, Subdivision Manager
2. Location map
3. Staff Report dated September 9, 2010, recommending approval
4. Final plat approved by Planning Commission
5. Final plat submitted by the applicant
6. Preliminary plat
7. Aerial map
8. Letter dated June 20, 2012, from Tom L. McCaleb, P.E., SMC Consulting Engineers, P.C., to Mr. Shawn O'Leary, P.E., Director of Public Works
9. Letter dated June 26, 2012, from Roger Brown, Ed.D, Assistant Superintendent, Norman Public Schools, to Shawn O'Leary, P.E., CFM, Director of Public Works
10. Engineer's Estimate dated July 10, 2012, from Tom L. McCaleb, P.E., SMC Consulting Engineers, P.C., to Mr. Todd McLellan, P.E., Development Engineer
11. Pertinent excerpts from Planning Commission minutes of June 10 and September 9, 2010

Participants in discussion

1. Mr. Tom McCaleb, 815 West Main Street, Oklahoma City, engineer representing the applicant

and the question being upon approving the final plat for Fountain View Addition, Section 1, and the deferral of paving improvements for 48th Avenue N.W., and upon the subsequent acceptance, authorization, and directive, a vote was taken with the following result:

YEAS:

Councilmembers Castleberry, Gallagher, Griffith, Jungman, Kovach, Lockett, Spaulding, Williams, Mayor Rosenthal

NAYES:

None

The Mayor declared the motion carried and the final plat for Fountain View Addition, Section 1, and the deferral of paving improvements for 48th Avenue N.W., approved; the public dedications contained within the plat were accepted, the Mayor was authorized to sign the final plat and subdivision and maintenance bonds subject to the City Development Committee's acceptance of all required public improvements and receipt of a fee in the amount of \$62,640 for deferral of street improvements for 48th Avenue N.W., within ten 10 days after approval, and the filing of the final plat was directed.

Item 34, being:

CONSIDERATION OF APPROVAL OF A REVOCABLE LICENSE TO SASSAN MOGHADAM TO OCCUPY STREET RIGHT-OF-WAY FOR PLACEMENT OF ENTRANCE ARCHES INTO FOUNTAIN VIEW ADDITION LOCATED ON THE EAST SIDE OF 48TH AVENUE N.W. SOUTH OF WEST TECUMSEH ROAD.

Councilmember Spaulding moved that a Revocable License to Sassan Moghadam to occupy street right-of-way for placement of entrance arches into Fountain View Addition for a fee of \$486 per year be approved, which motion was duly seconded by Councilmember Griffith;

Item 33, being:

CONSIDERATION OF A FINAL PLAT FOR FOUNTAIN VIEW ADDITION, SECTION 1, ACCEPTANCE OF PUBLIC DEDICATIONS CONTAINED THEREIN, AND DEFERRAL OF STREET IMPROVEMENTS FOR 48TH AVENUE N.W. (GENERALLY LOCATED ON THE EAST SIDE OF 48TH AVENUE N.W. SOUTH OF WEST TECUMSEH ROAD)

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NAYES:

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