FINANCE COMMITTEE MEETING AGENDA

MONDAY, JULY 10, 2023 AT 5:30 PM

MUNICIPAL BUILDING COUNCIL CHAMBERS – 106 JONES STREET, WATERTOWN, WI 53094

By Phone or GoToMeeting: Members of the media and the public may attend by calling:
+1 (571) 317-3122 **Access Code:** 153-925-469 or https://www.gotomeet.me/EMcFarland
All public participants' phones will be muted during the meeting except during the public comment period.

1. CALL TO ORDER

2. REVIEW AND APPROVE MINUTES

A. Finance Committee minutes of June 26

3. BUSINESS

A. Review and take possible action: Job description reviews for 2024
   1. Public Works: Water/Wastewater Division

B. Update and discuss: Payroll time entry process

C. Review and take action: Fire Station Sustainability Features

D. Review and take action: recommend resolution to Council for the sale of approximately $13,080,000 Note Anticipation Notes

E. Review and take possible action: Fire Station Construction Management Services

F. Review and take action: accepting a donation for $160,000.00 from the Watertown Riverfest Committee 1987-2022 for the Riverside Park Walls/Bridges project

G. Review and take action: Riverside Park Restroom Project Rebid

H. Review and discuss: initial draft of FY24 Capital Improvement Plan

I. Discuss and take possible action: Opticom

J. Review and take possible action: Riverside restroom review of plans and bid options

4. ADJOURNMENT

Persons requiring other reasonable accommodations for any of the above meetings, may contact the office of the City Clerk at mdunneisen@watertownwi.gov, phone 920-262-4006

A quorum of any City of Watertown Council, Committee, Board, Commission, or other body, may be present at this meeting for observing and gathering of information only

THE CITY OF WATERTOWN

FINANCE COMMITTEE MEETING MINUTES

MONDAY, JUNE 26, 2023, AT 5:30 PM

MUNICIPAL BUILDING COUNCIL CHAMBERS – 106 JONES STREET, WATERTOWN, WI 53094

Members present: Mayor McFarland, Alderpersons Bartz, Lampe, Moldenhauer and Davis (via video)

Others present: Finance Director Mark Stevens, Attorney Steven Chesebro, Fire Chief Travis Teesch, Streets Operations Manager Stacy Winkelman, Public Works Director Jaynellen Holloway, Public Health Director Carol Quest, Water Manager Pete Hartz, Rec/Parks Director Kristine Butteris, Andrea Draeger

1. **Call to order.** Mayor McFarland called the meeting to order at 5:33 p.m.
2. **Minutes** from the meetings of **May 22**, **May 31**, and **June 20** were presented. Ald. Bartz, seconded by Ald. Lampe, moved to approve all three. Unanimous voice vote.
3. Stacy Winkelman presented and recommended that **Thomas Poff** be hired as **Solid Waste Laborer** at G/S G1 [$21.51/hr]. Ald. Lampe moved, supported by Ald. Bartz, to approve this hire. Unanimous voice vote.
4. Mayor McFarland summarized the process that is beginning to assess the **group of similar positions** that have titles such as **administrative assistant, executive assistant, accounting/billing clerk**, etc. This project will send the current job descriptions to Carlson Dettmann, our HR consultant, to streamline the positions, reduce titles, create a progression in an Administrative Assistant category, and place the new titles into appropriate grades.
5. A new process has been implemented as an input into the FY24 budget process: **presentation of any personnel additions or reclassifications in advance** to the finance committee to determine if a review should be requested with Carlson Dettmann for grade assignment. Various department heads presented explanations for their requests:
    a. Health: office manager (modification)
    b. Library: assistants to be added to pay rate table, catalog/circ assistant, teen services assistant, professional: adult services, professional: children services (Presentation of library positions was informational; approval by the Library board had already been given.)
    c. Park/Rec: recreation program manager (add)
    d. Fire: motor pump operator (specify this rank to some FF), assign three specialty oversights to battalion chiefs, deputy chief (add)
    e. Human Resources: HR assistant (add)
    f. Water: business office manager (modification)
    g. Engineering: stormwater project manager/grant coordinator (modification)
    h. Bldg, Safety, Zoning: zoning/administrative specialist (modification), clerk/typist (PT add)

    Ald. Lampe, seconded by Ald. Moldenhauer, made a motion to **move forward with submissions to Carlson Dettman for all positions except Water: business office manager** (bring back completed documentation and meet with mayor before request) **and BSZ zoning/administrative specialist** (wait for the administrative assistant project results). The committee unanimously approved by voice vote.

NOTE: Ald. Davis left the meeting between the fire and human resources presentations. She was provided the opportunity to make comments on ones that she was not going to hear.

6. Mr. Stevens provided a summary of the **revised costs of property and liability insurance premiums** for 2023. Although there were property premium increases (library addition, 7% increase to all buildings), due to changes in cyber liability carrier coverage in January, there was no net impact on the annual budget. He had asked for quote alternatives if the property deductible were to be raised from $2500 to either $5000 or $10,000, but the savings were not substantive in amounts. The **committee agreed to not alter the deductible**.

   It was cited that the premiums for the library's portion of the property insurance has been included in the General Fund [01] and not segmented to the Library Fund [11] in a similar fashion to the utility fund allocations. Mr. Stevens requested **consideration in the assignment of the library's portion of property insurance premiums to be allocated to Fund 11** effective with the 2024 budget cycle. Ald. Bartz, supported by Ald. Moldenhauer, moved to request the finance director, library director and library board work to craft a plan to allocate a shared expense.

7. **FY24 Capital Improvement Plan** (CIP): The CIP was presented with a few explanatory comments due to the length of tonight's meeting. This will be added to the next meeting agenda.

8. Ald. Bartz moved, supported by Ald. Lampe, to **convene into closed session** per Wis. Stat. Sec. 19.85(1)(g) to confer with legal counsel of the governmental body who is rendering oral or written advice concerning strategy to be adopted by the body with respect to litigation in which it is or is likely to become involved (Status update for Juhl). Unanimous approval via roll call vote.

9. The finance committee reconvened into open session.

10. Adjournment. Ald. Moldenhauer moved to approve adjournment, seconded by Ald. Lampe, and carried by unanimous voice vote.

Respectfully submitted,

Mark Stevens, Finance Director

Note: These minutes are uncorrected, and any corrections made thereto will be noted in the proceedings at which these minutes are approved.

THE CITY OF WATERTOWN
Opportunity runs through it.

Water Systems
800 Hoffmann Drive • P.O. Box 477 • Watertown WI 53094-0477
WASTEWATER (920) 262-4085 • WATER (920) 262-4075

To: Mayor McFarland & Members of the Finance Committee 06/28/2023
From: Peter Hartz – Water Systems Manager

Re: Water System agenda items for Finance committee meeting 07/10/2023

Dear Mayor McFarland & Committee Members:

Water Systems agenda item:

1. Review and update – water and wastewater job description and position reviews.

   Several positions are currently under consideration for evaluation by Carlson Dettmann, but I only have one position forward for a recommendation for a pay adjustment, the Utilities Billing Clerk. When the 2024 budget is presented, I would like to be able to have completed this position review and have an updated recommendation from the job position review consultant. Attached is the corrected and revised job description that matches the responsibilities of this position. Also included is the job description qualification form (JDQ), that shows all updates and includes other information to explain the job and its responsibilities and is shown in red font on that form.

   The water systems utility clerk employee, my supervisor, and I believe this job was not properly defined when adjusted in January of 2020. The request at that time was for a comparison to other Business Office Manager jobs in the workforce, the past comparisons and the title did not change from Billing Clerk. I reviewed similar positions with other business operations and believe the description in the JDQ could be several, but Utility Business Office Coordinator (Accounting Coordinator) was chosen as a good comparison to the duties being performed in this position.

   I am seeking approval for this position to undergo another review with the consultant, and to have them properly take a closer look at other jobs of similarity and current market rates. Since the last review, the responsibilities have changed with the addition of one (1) full-time equivalent employee under this person's direction (Assistant Utility Clerk), but I don't believe the financial responsibilities were not taken into consideration last time so included more details on those in the JDQ.

   There are other jobs under review including all administration staff members and a few of the 4 employees in the water department maintenance group who have similar overlapping duties but very different specific jobs. We wish to review duties as management continues to cross-train between water and wastewater – these positions all perform dual duty for each department but that is not reflected in the job descriptions.

   Thank you for your consideration and if anyone has any questions, please feel free to contact me anytime.

   Sincerely,

   Peter Hartz
   Watertown Water Systems

CITY OF WATERTOWN POSITION DESCRIPTION

This job description has been prepared to assist in the evaluation of various classes of responsibilities, skills, and working conditions. It indicates the kinds of tasks and levels of work difficulty generally required of positions given this job. The principle duties and responsibilities enumerated are all essential functions except for supplemental duties and responsibilities. Supplemental duties are described beginning with the work "May". This job description is not intended to limit or modify the right of any supervisor to assign, direct and control the work of employees. Nothing contained herein is intended or construed to create or constitute a contract of employment between any employee or group of employees and the City. The City retains and reserves any and all rights to change, modify, amend, add to, or delete from any section of this description as it deems, in its judgment, to be proper.

Revised: 03/10/98, 09/27/00, 04/01/08, 11/02/11, 08/2019, 06/27/23

Title: ~~Billing Clerk~~ Utility Billing Clerk (Request Business Office Coordinator)
Department: Water & Wastewater Utility
Pay Grade: ~~Billing Clerk~~ G (pending review) **FLSA Status:** Non-Exempt ~~Union~~

General Summary:

~~This position is responsible for processing and maintaining utility billing accounts; preparing monthly billing; preparing delinquent water bills to be placed on taxes; prepare information for PSC report to give to auditor; and ability to work overtime as needed.~~

This is a skilled and technical position whose primary duties involve the following: calculation, processing, and mailing city utility bills (which include water, sewer, garbage, recycling, and storm water charges) correctly and in a timely manner. Notifying customers and property owners of past due amounts and transfer balances to City Hall for collection on property taxes. Handle bankruptcy changes set up and maintain customer accounts. Code work orders and add miscellaneous Accounts Receivable to customer accounts if possible, to limit the amount of invoicing needed. Maintain billing, cross connection and other customer records, inventory and other expenses for City Hall and our Auditors for the Public Service Commission Report.

The most important impact of this position is maintaining cash flow by billing customers correctly and on- time by scheduling meter changes in a timely manner to keep them working correctly and following timelines and procedures set up in State Statutes, City Municipal Code and United States Post Office Rules and Regulations and maintaining records for Public Service Commission reports and rate increases. Establish and maintain harmonious working relationships with management, staff and external contacts. Perform special projects as assigned, including coordinating, preparing and assisting with statistical reports, assisting with budgets and research and compilation of information.

Reporting Responsibilities:

~~Under direct supervision of the Water Systems Manager and indirect supervision of Assistant Water Systems Managers, Water and Wastewater.~~

This position will be under general supervision of the Water Systems Manager. This person serves as a key role in assisting the Manger with preparing the annual budget by providing necessary data related to annual utility expenditures covering operational and administrative areas. The position also works closely with City Clerk's office to track expenditures and other financials as it relates to the utility.
Provides backup administrative support for other clerical staff (admin I, admin II, and assistant billing clerk) as needed for both the Wastewater Department and the Water Department.

Specific Accountabilities:

~~1. Maintain, prepare, and process monthly utility billing records and miscellaneous billing.~~
~~2. Process and prepare information for City Hall for delinquent water bills to be placed on taxes.~~
~~3. Prepare job orders.~~
~~4. Answer questions pertaining to utility bills and other customer questions.~~
~~5. Maintain inventory control in utility billing.~~

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6. ~~Back up for Customer Service/Department Secretary.~~
7. ~~Back up for cash receipts.~~
8. ~~Trained in accounts payable and payroll.~~

Physical Demands: Lifting approximately 20 lbs. occasionally, with infrequent lifting and/or carrying of objects weighing up to 50 lbs. Stooping, kneeling, crouching, crawling, reaching, handling, feeling, working with fingers, seeing, and walking or standing to a significant degree. Specific vision abilities required by this job include close vision, distance vision, color vision, peripheral vision, depth perception, and the ability to adjust focus. Requires the ability to recognize and identify similarities or differences between characteristics of colors, shapes, sounds, odors, and textures associated with job-related objects, materials and tasks.

Environmental Adaptability: Tasks are primarily performed indoors, but on rare occasions may risk exposure to adverse environmental conditions, such as dirt, dust, pollen, odors, wetness, fumes, temperature and noise extremes, machinery, vibrations, electric currents, toxic/poisonous agents, disease, or pathogenic substances.

Judgment and Situational Reasoning Ability: Ability to exercise independent judgment to apply facts and principals for developing approaches and techniques to proper resolution. Requires the ability to exercise the judgment, decisiveness and creativity required in situations involving the direction, control and planning of an entire program or multiple programs.

Knowledge of specialized software programs in use for utility billing, time keeping, and water meter reading used for billing and reporting purposes.
Knowledge of equipment and materials in use for water and wastewater operations.
Ability to provide backup supervision, ability to persuade, convince and train others. Ability to advise and interpret how to apply policies procedures and standards to specific situations.
Ability to utilize descriptive data and information such as inventory records and reports, repair orders and documentation, and utility equipment requisitions.
Ability to work a flexible shift, at time with accuracy and while fatigued. Common sense / detail orientated.
Mathematic ability to add, subtract, multiply, divide, calculate percentages, fractions, and decimals.

Knowledge, Skills, and Abilities:

~~High school graduate (or HSED equivalent) and additional education in accounting and or equivalent combination of education, experience and training that provides the following knowledge, skills, and ability:~~

1. ~~Computer literate with experience in Microsoft Word, Excel, and Access.~~
2. ~~Ability to understand and follow oral and written instructions.~~
3. ~~Ability to develop and maintain effective working relationships with other employees and the public.~~
4. ~~Must be able to speak, read, write and spell in the English language.~~

- **Water, Wastewater, Storm Water, Garbage & Recycling Utility Billing:**
  - Calculate, print, correct, burst, sort, prepare and mail city utility bills which requires all of the following:
  - Import reads into utility billing system & meter change out reads are entered and calculated correctly.
  - Analyze consumption journals, send letters for high consumptions and create work orders for non-registering meters.
  - Enter reads for manually read meters.
  - Calculate bills for back billing if meters were not working or calculate refunds if needed for misreads.
  - Check and update zip+4 on customer accounts.
  - Change service rates at the correct time after rate increases are approved.
  - Provide usage information to Lab Manager and calculate and add sewer surcharge fees to bills Make sure annual fees are billed at the correct time.
  - Add, change and delete customer records for water, sewer, fire protection, garbage and storm water utility charges. Create and update spreadsheets for review and budget purposes for Street Department

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(garbage and storm water utilities) and gather information for rate changes for our Auditors for water, sewer and fire protection.

- Correct/adjust bills for refunding overpayments, calculating credits, etc.
- Maintain customer checking/savings account information for automatic withdrawals on the due date.
- Add penalties after the due date and reapply amounts due, fees and penalties for non-sufficient funds, closed bank accounts, etc.
- Update and check payments made on-line through our third-party payment processor.
- Go through County Assessor changes for both Dodge and Jefferson Counties and make changes to maintain customer addresses, ownership changes and parcel ID numbers.
- Set up new accounts and mail welcome letter of payment options, water, money and time saving tips.
- Serve as Administrator to maintain user ID, password, access and rights to Caselle Utility Billing program, Payment Service Network web site, and Acuity Scheduling web site.

- **Business Office/ Customer Service Management:**
  - Directs and oversees the assistant billing clerks daily duties.
  - Assist administrative assistant with all day-to-day operations and functions of the water business office and customer service as it relates to all subsections of the utility (operations, distribution, meter shop, and business office).
  - Compose and track customer correspondence in regard to cross connection control program, meter change outs, high water usage, private leak repairs, special utility projects and programs, winter run allowance, and customer complaints. Must also follow-up in a timely manner as necessary based on the notification time period.
  - Serve as primary back up for Administrative Assistant II for payroll, accounts payable and accounts receivable.
  - Answer customer phone calls, set up appointments, do final bills, assist with coding accounts receivable for invoicing, assist customers with making payments, picking up deduct meters and explain how to locate leaks within their homes.
  - Create itinerary and gather work orders for next day for Water Department Personnel.

- **Create and Delegate Meter Shop Work Orders:**
  - Create work orders for department staff as necessary and confirm its completion. If the work order is complaint driven, follow up with the complainant to verify their satisfaction. Prioritize the work orders as necessary based on severity to minimize damage and water service disruption.
  - Create work orders and mail letters to customers for meter change-outs/upgrades when needed (900 or more each year).
  - Maintain meter testing schedule.
  - Maintain customer accounts with old and new meter reads and meter records, maintain meter inventory and test records for the Public Service Commission (PSC).
  - Order meters, meter transmitters and other meter parts when needed and maintain physical inventory so that meters and parts are available when needed.

- **Assist the Water Systems Manager**
  - As necessary to obtaining current and historical; records, data, account balances, contract documents, and all other information as determined necessary by the Water Systems Manager to facilitate and maintain the everyday operations of the utility.
  - Provide statistical information to the manager on a monthly basis or as needed to complete reports.
  - Assist the manager in the annual budget preparation process based on annual expenditure data related to water meter purchases and other office supply expenses.

- **Public Service Commission Water Utility Reporting:**
  - Create, route and process job orders, code them with PSC account numbers and calculate truck and inventory expenses for City Hall, the PSC and auditors.
  - Maintain water loss, service, water main and hydrant inventory from these job orders. Calculate miscellaneous accounts receivable charges from work orders (hydrant meter usage, turn-ons,

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etc.), code with PSC account numbers and add charges to utility account or give to accounts receivable dept. for invoicing.
- Maintain customer class information and continuing property records for the Public Service Commission.
- File work orders, cross connection reports and other paperwork. Clean out files and create new files at the end of the year.
- Maintain record retention information and decide when records can be destroyed.

- **City of Watertown Clerk Office duty shared and related management:**
  - Process and determine if and what amounts need to be written off for bankruptcies and if they need to be sent to the City Attorney for filing.
  - Maintain impact fee records and mail letter of utility rules to builder/owner. Maintain petty cash for Water Utilities business office.
  - January: Create inventory count spreadsheet, update after count is complete and adjust inventory – email adjustments to City Hall for General Ledger update.
  - September-November: Create and check tax roll for delinquent amounts to be sent to property taxes, create Excel files, print and mail letters to property owners, landlords and tenants by October 15th.
  - Get reports ready for the Post Office and create daily reports for City Hall and Customer Service Rep.
  - Add the 10% penalty on November 1st, run reports and remove balances on November 15th.
  - Mail certified list of utility lien to Dodge and Jefferson County as per Wis. Statute.

- **Computer knowledge and understanding of input/export of data:**
  - Microsoft Suite (Office 365, Word, Excel, Access, Outlook, PowerPoint, Publisher, SharePoint Workspace, InfoPath Designer).
  - Utility record keeping software. (researching software package options)
  - Proprietary Advanced Meter Analytics software: Badger ReadCenter & Beacon AMA, Payment services network, and Acuity Scheduling.
  - Geographic information system: ESRI's ArcGIS version 10.3.1., City of Watertown, Counties of Jefferson and Dodge GIS & Ascent Land Records
  - Time Management: (researching new software package options), Google electronic calendar Communication: CC&N communication software with telephone, smart phone, CB radios, fax machine Miscellaneous office Equipment: Internet, laptop computer, telephone, voicemail, cellular phone, Email, fax, calculator, printer, copier, scanner, automatic bill folder/stuffer, calculator, HydroSoft (HydroCorp online reporting software), Adobe, Skype
  - Other custom spreadsheets (Requisitions, Budgeting, Work Orders, Purchasing Card), Time clocks (Time and Attendance)
  - Civic Systems software package which includes: utility billing, ACH direct pay, electronic read interface, service orders, splitter, tax certification, online bill pay and bill presentation, and cash receipting.
  - Public Service Commission web site access administration experience needed for annual water report.

- **Training other:**
  - Complete working knowledge of Microsoft Office, bankruptcy case basics, certificate received for training on programming and using meter reading handhelds, and certificates received for training completed on the following software: Connect, Read Center/Galaxy, Caselle Clarity billing, tax roll and meter management programs. Training required on the following websites: Payment Service Network website, the United States Postal Service Postal One! website and Civic's customer support portal. Training on Public Service Commission, United States Post Office and City Municipal rules and regulations, training on using the bill burster and knowledge of payroll, accounts payable/receivable and Badger Meter metering devices. Position is cross-trained on meter reading and changing remote registers and using the Trimble handheld for the Galaxy transmitters.

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- **Education / Licensing:**
  - Bachelor's degree in business administration or related field preferred (accounting or finance). Associate's degree and proven experience as an office administrator, office manager, or similar role in a utilities company or related industry. Proficient in MS Office, accounting software, and database systems. Excellent verbal and written communication skills. Strong organizational, time management, and multitasking skills. Attention to detail and accuracy. Ability to work independently and as part of a team. Knowledge of utility operations, equipment, and regulations.
  - Requires; High school graduate degree plus Associates Degree with course work and/or 6 years' experience in administrative work including accounting.
  - CPR, First Aid, AED

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THE CITY OF WATERTOWN

Finance Departm
106 Jones Street
PO Box 477
Watertown, WI 53094-0477
(920) 262-4000

To: Finance Committee
From: Mark Stevens
Date: July 10, 2023
RE: Payroll Time Entry Process

We have been working with departments to transition responsibility for time entry to the individual employee (instead of admin assistants) and review/approval to supervisors/department heads (instead of payroll staff). I believe we're at the point to make the next iteration of changes. The current documentation provided to payroll from the department for review, by level of communication beyond the miPayOnline time entry portal:

Nothing (small number of employees that doesn't fluctuate):
Administration, Alders, Attorney, Court, Finance, Mayor, Municipal Building

Dept Summary (provides dept totals of hours and employees):
BSZ, Engineering, Media, Forestry, Park, Park/Rec Administration

Employee Summary (provides list of employees with hours):
Fire, Library

Dept Summary AND employee time sheets:
Health, Police (incl auxiliary & crossing guards), Recreation/Pool, Solid Waste, Street, Wastewater, Water

Effective with the next pay period, I will have staff alter the submissions as follows:

- Library: dept summary
- Health: dept summary
- Police: employee summary
- Solid Waste: dept summary
- Street: dept summary
- Wastewater: dept summary
- Water: dept summary

The Recreation/Pool has approximately 60 seasonal part-timers that are split between indoor/WAC pools and are varied in assignments and rates of pay. We recently asked the department to add employee numbers and scan in numerical order to enable faster data entry and review by payroll staff. Considering some ongoing issues with the miPay app and smart device incompatibilities, it will be best for the scanning of time sheets to continue.

Finance staff has created a standardized dept summary form to create an efficiency for the payroll staff review.

Watertown Fire Department

106 Jones Street, Watertown, WI 53094 • 920-261-3610 • 920-261-7527 fax
www.watertownfiredept.com

MEMO

TO: Finance Committee

FROM: Fire Chief Travis Teesch

DATE: July 10, 2023

RE: FIRE STATION UPDATE: Sustainability Features

The design and programming for the new fire station has identified a few key sustainability features that should be considered. These items come with an upfront cost but offer savings over the lifespan of the building.

Incorporating a geothermal heating and cooling system into a project of our scope has an initial estimated cost of an additional $300,000 however, the average year savings is projected to be $21,000 creating a potential savings of $735,000 over a 50-year building life span.

The addition of a Photovoltaic (PV) system is another area where upfront costs would be higher, but a savings would be realized over the life of the building. The initial cost for PV is estimated to be $364,000 with a savings of $21,000 a year in energy costs. The current life of PV panels are 25 years.

Other sustainable features included LED lighting, high recycled material content, UV control, natural lighting, and an energy conscious designing. These features have minimal, if any, additional costs and are already included in the design of the station.

Choices on incorporating geothermal and photovoltaic systems need to be made at this stage in the project to provide the engineering and architectural teams guidance on system plans and designs.

City of Watertown

Fire Station Financing

July 5, 2023

Bradley D. Viegut, Managing Director

bviegut@rwbaird.com
777 East Wisconsin Avenue
Milwaukee, WI 53202
Phone 414.765.3827

City of Watertown

FIRE STATION FINANCING

July 5, 2023

Summary of Financing

Issue:	Note Anticipation Notes	General Obligation Refunding Bonds
Estimated Size:	$13,080,000	$13,080,000
Purpose:	• Fire Station • Capitalized Interest through 4/1/2025	• Refinance the Note Anticipation Notes
Structure:	Matures 10/1/2025	Matures Annually 6/1/2026 – 6/1/2044
First Interest:	April 1, 2025	December 1, 2025
Callable:	Callable 4/1/2025	TBD
Estimated Interest Rate:	4.17%	4.10%
Detailed Analysis:	Page 2	Page 2

City of Watertown

FIRE STATION FINANCING

July 5, 2023

Detailed Analysis

YEAR DUE	NET GENERAL FUND EXISTING DEBT SERVICE (a)	2024 CIP $3,740,000 G.O. PROMISSORY NOTES Dated April 1, 2024 (First interest 12/1/24) PRINCIPAL (6/1)	NET INTEREST (b) (6/1 & 12/1) TIC= 3.18%	TOTAL	Project Fund: $12,500,000 Fire Station Project $13,080,000 Note Anticipation Note Dated April 1, 2024 (Due 10/1/25) INTEREST (4/1 & 10/1) TIC= 4.17%	Refunding of Note Anticipation Note $13,080,000 G.O. REFUNDING BONDS Dated April 1, 2025 (First interest 12/1/25) PRINCIPAL (6/1)	NET INTEREST (c) (6/1 & 12/1) TIC= 4.10%	TOTAL	FUTURE BORROWINGS (d) (e)	Overall Taxpayer Impact General Fund COMBINED DEBT SERVICE	COMBINED DEBT MILL RATE (f)	YEAR DUE
2023	$4,745,942								$0	$4,745,942	$2.54	2023
2024	$4,854,063		$0	$0					$0	$4,854,063	$2.55	2024
2025	$4,443,850	$480,000	$35,477	$515,477	$588,600		$0	$0	$0	$4,959,327	$2.55	2025
2026	$3,875,638	$190,000	$158,250	$348,250		$110,000	$599,900	$709,900	$131,500	$5,065,288	$2.55	2026
2027	$3,479,531	$450,000	$142,250	$592,250		$275,000	$592,200	$867,200	$221,500	$5,160,481	$2.55	2027
2028	$3,345,531	$475,000	$119,125	$594,125		$225,000	$582,200	$807,200	$414,925	$5,161,781	$2.50	2028
2029	$2,415,856	$495,000	$94,875	$589,875		$525,000	$563,919	$1,088,919	$1,068,150	$5,162,800	$2.45	2029
2030	$2,026,906	$525,000	$69,375	$594,375		$550,000	$535,013	$1,085,013	$1,452,950	$5,159,244	$2.40	2030
2031	$1,953,561	$550,000	$42,500	$592,500		$585,000	$503,800	$1,088,800	$1,527,725	$5,162,586	$2.36	2031
2032	$726,403	$575,000	$14,375	$589,375		$615,000	$470,800	$1,085,800	$2,759,425	$5,161,003	$2.31	2032
2033	$338,531					$650,000	$436,825	$1,086,825	$3,733,800	$5,159,156	$2.26	2033
2034	$337,581					$685,000	$401,781	$1,086,781	$3,738,550	$5,162,913	$2.22	2034
2035	$341,481					$725,000	$364,769	$1,089,769	$3,728,225	$5,159,475	$2.18	2035
2036	$340,231					$760,000	$329,588	$1,089,588	$3,734,322	$5,164,140	$2.14	2036
2037	$338,881					$790,000	$296,650	$1,086,650	$3,736,725	$5,162,256	$2.09	2037
2038	$338,244					$825,000	$262,331	$1,087,331	$3,735,200	$5,160,775	$2.05	2038
2039	$338,125					$860,000	$226,525	$1,086,525	$3,738,450	$5,163,100	$2.01	2039
2040	$337,722					$900,000	$189,125	$1,089,125	$3,736,475	$5,163,322	$1.97	2040
2041						$935,000	$150,131	$1,085,131	$4,074,175	$5,159,306	$1.93	2041
2042						$980,000	$109,438	$1,089,438	$4,071,400	$5,160,838	$1.90	2042
2043						$1,020,000	$66,938	$1,086,938	$4,073,100	$5,160,038	$1.86	2043
2044						$1,065,000	$22,631	$1,087,631	$4,074,200	$5,161,831	$1.82	2044
	$34,578,079	$3,740,000	$676,227	$4,416,227		$13,080,000	$6,704,563	$19,784,563	$53,750,797	$112,529,665		

Assumes NAN principal paid with bond proceeds on 4/1/2025. Assumes NAN interest capitalized until 4/1/25.

(a) The City will make principal payments of $5,325,000 in 2024.
(b) Hypothetical bid premium on estimated interest cost in the amount of $264,189.
(c) Hypothetical capitalized interest on estimated interest cost in the amount of $401,400.
(d) Assumes future borrowings of $3,000,000 annually beginning in 2025 and thereafter amortized over 8 years at 3.00%.
(e) This information is provided for information purposes only. It does not recommend any future issuances and is not intended to be, and should not be regarded as, advice.
(f) Mill rate based on 2022 Equalized Valuation (TID-OUT) of $1,868,971,600 with 2.00% growth thereafter.

City of Watertown

FIRE STATION FINANCING

July 5, 2023

Important Disclosures

Robert W. Baird & Co. Incorporated ("Baird") is not recommending that you take or not take any action. Baird is not acting as financial advisor or municipal advisor to you and does not owe a fiduciary duty pursuant to Section 15B of the Securities Exchange Act of 1934 to you with respect to the information contained herein and/or accompanying materials (collectively, the "Materials"). Baird is acting for its own interests. You should discuss the Materials with any and all internal or external advisors and experts that you deem appropriate before acting on the Materials.

Baird seeks to serve as underwriter in connection with a possible issuance of municipal securities you may be considering and not as financial advisor or municipal advisor. Baird is providing the Materials for discussion purposes only, in anticipation of being engaged to serve as underwriter (or placement agent).

The role of an underwriter includes the following: Municipal Securities Rulemaking Board Rule G-17 requires an underwriter to deal fairly at all times with both municipal issuers and investors. An underwriter's primary role is to purchase the proposed securities to be issued with a view to distribution in an arm's length commercial transaction with the issuer. An underwriter has financial and other interests that differ from those of the issuer. An underwriter may provide advice to the issuer concerning the structure, timing, terms, and other similar matters for an issuance of municipal securities. Any such advice, however, would be provided in the context of serving as an underwriter and not as municipal advisor, financial advisor or fiduciary. Unlike a municipal advisor, an underwriter does not have a fiduciary duty to the issuer under the federal securities laws and is therefore not required by federal law to act in the best interests of the issuer without regard to its own financial or other interests. An underwriter has a duty to purchase securities from the issuer at a fair and reasonable price but must balance that duty with its duty to sell those securities to investors at prices that are fair and reasonable. An underwriter will review the official statement (if any) applicable to the proposed issuance in accordance with, and as part of, its responsibilities to investors under the federal securities laws, as applied to the facts and circumstances of the proposed issuance.

The Materials do not include any proposals, recommendations or suggestions that you take or refrain from taking any action with regard to an issuance of municipal securities and are not intended to be and should not be construed as ''advice'' within the meaning of Section 15B of the Securities Exchange Act of 1934 or Rule 15Ba1-1 thereunder. The Materials are intended to provide information of a factual, objective or educational nature, as well as general information about Baird (including its Public Finance unit) and its experience, qualifications and capabilities.

On April 1, 2019, Baird Financial Corporation, the parent company of Robert W. Baird & Co. Incorporated ("Baird"), acquired HL Financial Services, LLC, its subsidiaries, affiliates and assigns (collectively "Hilliard Lyons"). As a result of such common control, Baird and Hilliard Lyons are now affiliated. It is expected that Hilliard Lyons will merge with and into Baird later in 2019.

Any information or estimates contained in the Materials are based on publicly available data, including information about recent transactions believed to be comparable, and Baird's experience, and are subject to change without notice. Baird has not independently verified the accuracy of such data. Interested parties are advised to contact Baird for more information.

If you have any questions or concerns about the above disclosures, please contact Baird Public Finance.

IRS Circular 230 Disclosure: To ensure compliance with requirements imposed by the IRS, we inform you that the Materials do not constitute tax advice and shall not be used for the purpose of (i) avoiding tax penalties or (ii) promoting, marketing or recommending to another party any transaction or matter addressed herein.

DRAFT Resolution No. _____

RESOLUTION PROVIDING FOR THE SALE OF
APPROXIMATELY $13,080,000 NOTE ANTICIPATION NOTES

WHEREAS the City of Watertown, Jefferson and Dodge County, Wisconsin (the "City") is presently in need of approximately $13,080,000 for public purposes, including paying the cost of constructing and equipping a new fire station (the "Project"); and

WHEREAS it is desirable to borrow said funds through the issuance of note anticipation notes pursuant to Chapter 67, Wisconsin Statutes.

NOW, THEREFORE, BE IT RESOLVED by the Common Council of the City that:

Section 1. Issuance of the Notes. The City shall issue its Note Anticipation Notes in the amount of approximately $13,080,000 (the "Notes") for the purpose above specified.

Section 2. Solicitation for Sale of Notes. The Common Council hereby authorizes and directs the officers of the City and Robert W. Baird & Co. Incorporated ("Baird") to take all actions necessary to solicit proposals from potential purchasers of the Notes. At a subsequent meeting, the Common Council shall take further action to approve the details of the Notes and authorize the sale of the Notes.

Section 3. Term Sheet or Other Offering Document. The City Clerk shall cause a Term Sheet or other form of offering document concerning this issue to be prepared by Baird. The appropriate City officials shall certify said Term Sheet or other form of offering document, such certification to constitute full authorization of the Term Sheet or other form of offering document, under this Resolution.

Section 4. Reimbursement. The Common Council hereby officially declares its intent pursuant to Treasury Regulation Section 1.150-2 to reimburse any expenditures made in connection with the Project prior to the issuance of the Notes with the proceeds of the Notes in an amount not to exceed $13,080,000.

Adopted, approved and recorded July 18, 2023.

_____
Emily McFarland
Mayor

ATTEST:

_____
Megan Dunneisen
City Clerk

(SEAL)

Watertown Fire Department

106 Jones Street, Watertown, WI 53094 • 920-261-3610 • 920-261-7527 fax
www.watertownfiredept.com

MEMO

TO: Finance Committee

FROM: Fire Chief Travis Teesch

DATE: July 10, 2023

RE: FIRE STATION UPDATE: RFP for Construction Management Services Fire Station Project

In February 2023 the City of Watertown contracted with Short Elliott Hendrickson Inc. (SEH) for Architect/Engineer (A/E) services for the design of its new Fire Station.

Since that time, we have been working on design programming for the fire station. That work is now completed, and efforts have shifted to creating construction documents. With this important milestone comes the need for us to seek RFP's for Construction Management Services. The value of working with a CM far outweighs the cost. For a project our size the expected cost for a CM is typically 3% – 5% of construction costs.

In return, the CM can help control project costs by assisting the design team with project coordination, preliminary cost estimating, finding potential bidders that are qualified to do the work, and value engineering.

Hiring a CM at this point in our project brings the advantage of cost control while maintaining a high-quality product. In addition, it provides a link between architects, engineers, and contractors while protecting the city's interests by ensuring the project is completed on schedule and under budget.

Post Office Box 351
Watertown, WI 53094
June 28, 2023

Jaynellen Holloway, City Engineer
Watertown Municipal Building
106 Jones Street
Watertown, WI 53094

Dear Jaynellen,

This letter is a followup to our conversation last week regarding a financial donation to the city of Watertown for the restoration of the iconic stone walls at Riverside Park.

The Watertown Area Community Foundation has agreed to provide a check in the amount of $160,000 as its share of the repair contract. That money is being given to the city by the Watertown Riverfest Committee 1987-2022.

As part of this contribution, the Riverfest Committee/Community Foundation expects the city to follow through on several conditions:

a. The repair of the bridge closest to the city sheds be repaired and not removed.
b. The Division Street entrance to the park remains undisturbed and any additional stone needed is to be found from areas which would not be noticed by the public.
c. A brass plaque be installed with the following statement "This wall and bridge restoration project was made possible through a donation by the Watertown Riverfest Committee 1987-2022. *Donated July of 2023."*

Please confirm in writing these conditions are acceptable to the city and will be incorporated as part of the project.

A check payable to the city in the amount of $160,000 will be forthcoming in a matter of days, as soon as it is released by our corporate bank.

Both the Riverfest Committee 1987-2022 and the community foundation are excited to participate in this historical preservation/restoration project.

Sincerely

Thomas Schultz, President
Watertown Area Community Foundation

Cc: Mayor Emily McFarland

Emily -
We finally have it completed!

City of Watertown - Capital Improvements 2024-2028				Funded								
		Rev: 230706		Not funded								
LINE		DEPARTMENT	PROJECT/PURCHASE DESCRIPTION	2023	2024	COMMENT	2025	2026	2027	2028	Future	REASON/NEED
1		**MUNICIPAL BUILDING**										
2	51-71	City Hall	Chiller system	111,497								Trane rebuild
3	51-71	City Hall	Master Planning		36,000							City-wide evaluation of space utilization in light of FD move
4	51-71	City Hall	FD space renovation				?					
5	51-71	City Hall	Boiler replacement (design)		30,000							
6	51-71	City Hall	Boiler replacement				?					
7	51-71	City Hall	Bathroom design		25,000		?					Replace original restrooms on second floor
8	51-71	City Hall	Tuckpointing and building maintenance				?					Cost unknown, needs to be addressed
9	51-71	City Hall	Remodel Engineering & BSZ								X	Safety concern, centralization and best utilization of shared secretary. Unifies workspace. Cost savings in elimination of duplicate office supplies and equipment.
10			MUNICIPAL BUILDING Subtotal	111,497	91,000		-	-	-	-	-	
11		**CABLE TV**										
12	51-84	Cable TV	Council Chambers video production system				100,000					Update equipment for livestreaming of city meetings
13	51-84	Cable TV	Broadcast system for cable channels					80,000				Current purchased in 2018. Typical lifespan is 5-7 years.
14			CABLE TV Subtotal	-	-		100,000	80,000	-	-	-	
15		**IT SYSTEMS**										
16	51-86	Network	Archiver	Incl in Bdgt								Email storage: $14K initial w/ monthly fees
17	51-86	Network	Servers and storage area network					100,000				Purch 2020: servers, SAN (storage), 10Gb switches
18			IT SYSTEMS Subtotal	-	-		-	100,000	-	-	-	
19		**POLICE**										
20	52-11	Police	Marked squads outfitted w/ equipment	125,000	150,000		150,000	150,000	150,000	150,000		Replace aging vehicles (fleet: 9 patrol, 2 Schl Resrc Offcr)
21	52-11	Police	Unmarked squads / SUV	30,000			40,000		40,000			Replace 2015 (5)
22	52-13	Dispatch	9-1-1 System Rebuild	127,561								AT&T (same company servicing Jeff Cty)
23	52-13	Dispatch	Mindshare (911)		Incl in Bdgt							Dispatch control desks (3)
24			POLICE Subtotal	282,561	150,000		190,000	150,000	190,000	150,000	-	
25		**FIRE**										
26	52-31	Fire	Engine							1,500,000		Purchase front line, due to age and call volume; cascade 1 to 2 & 2 to 3; remove third line engine. 3 needed for ISO grading. Lead time: 24-36 months.
27	52-31	Fire	Ladder					2,300,000				Current: 2006. Lead time exceeds 36 months.
28	52-31	Fire	Ambulance	AUTHORIZE >	320,000				385,000			Purchase front line unit (replaces '06 [$7K rprs in 2021]); cascade others
29	52-31	Fire	EMS EKG monitor		35,000							Life cycle: 10 years
30	52-31	Fire	Fire safety house/trailer			Grant?						Demo of escaping house fire; fire prevention; demo of fire sprinkler
31	52-31	Fire	Priority dispatching: ProQA					100,000				Assists dispatchers to quickly identify determinant codes
32	52-31	Fire	Opticom Emergency Vehicle Preemption			Grant?		200,000				Provides wiring to all traffic lights and connection to 7 vehicles
33	52-31	Fire	Hurst battery extrication tools	60,000								Update to aging tools (spreader, cutter, ram)
34	52-31	Fire	High pressure air bag lift system (Paratech)	10,000								Replaces 20-yr old unit
35	52-31	Fire	New Station: building design & construction documents	600,000								
36	52-31	Fire	New Station: construction management services		X							
37	52-31	Fire	New Station: construction		Antcptn Note		12,500,000					
38	52-31	Fire	Command Car Replacement	40,740			120,000					Replace 2013 car; used as mobile command post; includes outfitting
39	52-31	Fire	Car 3		116,000							To replace car 3 taken out of service in 2013. This unit will be used for fire inspections, to take to training events, pick up contaminated equipment after fires, etc. Command car for Deputy Chief.
40			FIRE Subtotal	710,740	471,000		12,620,000	2,600,000	385,000	1,500,000	-	
41		**EMERGENCY GOVERNMENT**										
42	52-51	Emergency Gov	Tornado Siren	26,000			25,000					2023: Boomer St. (50 yrs old); 2025: Boughton St.- inadequate coverage
43			EMERGENCY GOVERNMENT Subtotal	26,000	-		25,000	-	-	-	-	

City of Watertown - Capital Improvements 2024-2028				Funded								
		Rev: 230706		Not funded								
LINE		DEPARTMENT	PROJECT/PURCHASE DESCRIPTION	2023	2024	COMMENT	2025	2026	2027	2028	Future	REASON/NEED
44		**HEALTH**										
45	53-12	Health	Main door	10,000	Incl in bdgt							
46	53-12	Health	Basement lighting				22,000					Many light fixtures don't work, unable to fix due to old wiring. The basement serves as the main storeage area for program supplies and documents. It also serves as the threatening weather safe space. Working on estimates.
47	53-12	Health	Purchase house behind property				?					Jefferson Cty foreclosure
48			HEALTH Subtotal	10,000	-		22,000	-	-	-	-	
49		**PUBLIC WORKS**										
50	52-41	BS&Z	Vehicle (replacement)				?	25,000				Existing: 2013 Ford Escape (67K, condition: fair)
51	54-10	Engineering	Large Format Copier					70,000				Current one will be fully depreciated and obsolete, replacing 11 y/o unit
52	54-10	Engineering	Vehicle: city engineer (replacement)						35,000			Existing: 2014 Ford Escape
53	54-10	Engineering	Vehicle: Project Mgr (replacement)					35,000				Existing: 2013 Dodge 1500 Pickup
54			PUBLIC WORKS Subtotal	-	-		-	130,000	35,000	-	-	
55		**STREET**										
56	54-31	Street	Hot Box	30,000								Help to patch pot holes w/ cold mix year-round
57	54-31	Street	Patch Roller							75,000		Replace 1994 roller
58	54-31	Street	Salt shed doors		85,000							Extreme deterioration; noticed by DNR to fix (minor rprs in '23); east/west entrances
59	54-31	Street	Chipper		55,000							Replace; shared w/ Stormwater Util 50/50 (total = $110K)
60	54-31	Street	Street Loader				250,000					Replace loader shared w/ airport, 2010 w/ 4500 hours
61	54-31	Street	Tractor Backhoe				200,000					Replace 2013 backhoe w/ 1800 hours
62	54-31	Street	Excavator: rubber-tracked large mini		115,000							Replace 2008 unit w/ 4200 hours; shared w/ Storm Water (total= $130K)
63	54-31	Street	Vehicle (supervisor)	55,000								Replace 2008 unit w/ 108,000 miles, s/b replaced with pickup
64	54-31	Street	Truck: single-axle dump with plow/sander	AUTHORIZE >>			270,000	280,000			280,000	7 trucks aged 1994-98, 2 trucks eliminated recently
65	54-31	Street	Truck: tandem-axle dump with plow/sander	AUTHORIZE >>			150,000	300,000	300,000		300,000	2023: shared w/ StormWtr Util (total= $300K)
66	54-31	Street	Truck: one-ton with flatbed body	75,000				80,000				Replace 2003 Ford
67				(37,500)								Shared w/ Solid Waste (total= $75K)
68	54-31	Street	Main building: office windows and service doors				70,000					
69	54-31	Street	Overhead door replacements									
70	54-31	Street	Storage shed (replacement)					80,000				Approximately 50 years old and in poor shape
71	54-31	Street	Fuel tank and pump replacements/upgrade	65,000								Pump, computer system
72				(43,000)								Shared w/ Solid Waste & Storm Water (total= $65K)
73	54-31	Street	Holding tank in front of salt shed (to capture salty runoff)						35,000			50/50 cost share w/ Stormwater (total = $70K)
74	54-31	Street	Quarry study	40,000								Shared w/ Park & Stormwater (total= $120K)
75												
76	54-10	Main St	Downtown transportation network eval (one-way streets)	75,000	80,000							Scalable downtown traffic study
77	54-10	Main St	Downtown parking				85,000					Potential site acquisition
78	54-10	Main St	Trash receptacles							24,000		24 receptacles @ $1000 ea [Wait for Main St reconstruction]
79	54-10	Main St	Landscaping: trees/planting							17,000		$250/tree; $600/planter [Wait for Main St reconstruction]
80	54-10	Main St	Signal upgrade	25,000								
81	54-31	Street	Wayfinding signage system implementation							100,000		Includes area analysis, concept and design development, design intent
82	54-42	Chadwick Dr	Lighting (4)	32,000								
83			STREET Subtotal	316,500	335,000		1,025,000	740,000	335,000	216,000	580,000	

City of Watertown - Capital Improvements 2024-2028				Funded								
		Rev: 230706		Not funded								
LINE		DEPARTMENT	PROJECT/PURCHASE DESCRIPTION	2023	2024	COMMENT	2025	2026	2027	2028	Future	REASON/NEED
84		**AIRPORT**										
85	54-53	Airport	Fencing (section)		35,000							Wait until Boomer St moved
86	54-53	Airport	Federal Grant 5% match annual commitment	7,500							X	$7500 (each for 3 yrs) [5% matching of $150K in Fed funding] in Fund 5
87	54-53	Airport	Runway crack filling	20,000								
88	54-53	Airport	Boomer St move		62,000							$286,500 in Fund 5
89	54-53	Airport	Reconstruct runway 05/23 (longer)								X	$286,500 [$6M est project cost w/ 5% city share] in Fund 5
90	54-53	Airport	Construct taxi lane for remaining length of runway 11/29						50,000			
91	54-53	Airport	Parking: additional aircraft								185,000	37 existing tie-downs; need 55-60 during EAA Fly-in
92			AIRPORT Subtotal	27,500	97,000		-	-	50,000	-	185,000	
93		**RECREATION**										
94	55-20	Recreation	Vehicle replacement (SUV)		45,000							Frame rusted on truck; used for Kart Park
95			RECREATION Subtotal	-	45,000		-	-	-	-	-	
96		**AQUATIC CENTER**										
97	55-22	Aquatic Center	Slide rehabilitation	137,600								
98	55-22	Aquatic Center	Install water elevation play system in zero depth area					200,000				In water play feature update
99	55-22	Aquatic Center	Replace playground and sand with rubber surface				225,000					Original from 1993; portions have been removed; new play feature needed
100	55-22	Aquatic Center	Concessions: window/doors					50,000				Doors and windows sticking
101	55-22	Aquatic Center	Filtration systems		175,000							Current system obsolete, replacement parts becoming more expensive
102			AQUATIC CENTER Subtotal	137,600	175,000		225,000	250,000	-	-	-	
103		**SENIOR/COMMUNITY CENTER**										
104	55-24	Senior Center	Remodel entrance & welcome area	40,500			20,000					
105	55-24	Senior Center	Terrace retaining wall: rebuild	75,000								
106	55-24	Senior Center	Conley Hall: replace tile (peeling and cracking)						50,000			Conley Hall is most used room
107	55-24	Senior Center	Address leaking from deck addition								50,000	
108	55-24	Senior Center	Addition								X	Replace space used at Brandt Bldg
109			SENIOR/COMMUNITY CENTER Subtotal	115,500	-		20,000	-	50,000	-	50,000	

City of Watertown - Capital Improvements 2024-2028				Funded									
		Rev: 230706		Not funded									
LINE		DEPARTMENT	PROJECT/PURCHASE DESCRIPTION	2023	2024	COMMENT	2025	2026	2027	2028	Future	REASON/NEED
110		PARK										
111	55-41	Park	Playground replacements					100,000				Many aging playgrounds in the park system
112	55-41	Park	Parks & Open Spaces Plan		35,000							Due in 2024 for grant applications - will include bike & pedestrian plan
113	55-41	Park	Brandt Quirk: paint tennis courts		?							Last done in 2014
114	55-41	Park	Clark: replace shelter; add basketball & pickleball courts						425,000			Shelter needs to be replaced; full-court basketball and stand-alone pickleball lacking in parks
115	55-41	Park	Grinwald: construct restroom facilities				350,000					Currently use portables, a lot of rental use, need facilities
116	55-41	Park	Reagan: development								X	
117	55-41	Park	Riverside: master plan		65,000							Plan of action for the future growth and development of Riverside Park
118	55-41	Park	Riverside: old Park Shop 30x40 building								40,000	Original building failing structurally, serves as storage for supplies & equipment
119	55-41	Park	Riverside: pavilion improvements				500,000					Abate asbestos, update windows, make more marketable for use
120	55-41	Park	Riverside: upgrade kitchen facilities				85,000					Update entry wall, electrical and appliances
121	55-41	Park	Riverside: volleyball court at inclusive park				300,000					Wooden structure is breaking down and becoming a hazard
122	55-41	Park	Riverside: wall repair	87,400								Historic wall (Boughton to Labaree) cap failing, crumbling, dangerous
123	55-41	Park	Riverside: diamond irrigation system								X	Provide better maintainance
124	55-41	Park	Riverside: lighting								275,000	Aging system 46 years old
125	55-41	Park	Riverside: splash pad								X	
126	55-41	Park	Riverside: Labaree (fr Division to stone wall) & parking lot				200,000					
127	55-41	Park	T Johnson: backstop replacement					25,000				Rusted and an eyesore
128	55-41	Park	Union: backstop replacement					25,000				Rusted and an eyesore
129	55-41	Park	Washington: concession stand								500,000	No running water and not up to code
130	55-41	Park	Washington: diamond irrigation system								X	Provide better maintainance
131	55-41	Park	Quarry study	40,000								Shared w/ Street & Stormwater (total = $120K)
132	55-41	Park	Vehicle (used): supervisor	36,000								Upgrade 2003 vehicle w/ 128,000 miles: electrical issues, holes in floorboard
133	55-41	Park	Van (used replacement): mechanics/aquatics		35,000							
134	55-41	Park	Dump truck (replacement)				45,000					Bed of the current truck is rusting out
135	55-41	Park	Leaf collector				28,000					Replace 2009 unit, 700+ hours, high wear item
136	55-41	Park	Riding lawnmower	115,000								Replace 2014 w/ more efficient model with broom; frame rusting, 4000 hours
137	55-41	Park	Stump grinder								X	
138	55-41	Park	Shop renovations									
139			PARK Subtotal	278,400	135,000		1,508,000	150,000	425,000	-	815,000	

City of Watertown - Capital Improvements 2024-2028				Funded								
		Rev: 230706		Not funded								
LINE		DEPARTMENT	PROJECT/PURCHASE DESCRIPTION	2023	2024	COMMENT	2025	2026	2027	2028	Future	REASON/NEED
140		**INFRASTRUCTURE**										
141	58-11	Infrastructure	Street Resurfacing costs									
142	58-11	Infrastructure	Street Reconstruction costs	1,674,102	1,725,000		1,750,000	1,470,000	1,750,000			Amount to be determined based on budget and staff recommendations
143	58-11	Infrastructure	Street Seal coating									
144	58-11	Infrastructure	Sidewalk									
145			Shared w/ Utilities Funds	(200,000)								Shared w/ Water, Wastewater, Storm water
146	58-11	Infrastructure	Main St Downtown: reconstruction design	30,000	40,000		24,000	16,000	16,000			Church Street to Market Street (2028 Construction)
147	58-11	Infrastructure	Dewey Ave reconstruction (BIL Design)	120,000								100% Locally funded design to make project more competitive
148	58-11	Infrastructure	Dewey Ave reconstruction (BIL Construction)					280,000				20% city share
149	58-11	Infrastructure	Welsh Rd (near bypass) HSIP design	31,200								
150	58-11	Infrastructure	Welsh Rd (near bypass) HSIP construction		25,000							City portion is 10%
151	58-11	Infrastructure	TAP Grant: S Church shared use path design								X	City portion is 100%
152	58-11	Infrastructure	TAP Grant: S Church shared use path construction (20%)								X	City portion is 20% (note: 100% charge, 80% reimb in same year)
153	58-11	Infrastructure	TAP Grant: N 4th - Meadowbrook Dr shared use path design	185,000							X	City portion is 100%
154	58-11	Infrastructure	TAP Grant: N 4th - Meadowbrook Dr construction (20%)								X	City portion is 20% (note: 100% charge, 80% reimb in same year)
155	58-11	Infrastructure	Municipal Lots									
156	58-11	Infrastructure	Bridge inspection	15,000	20,000							Biennial inspections
157	58-11	Infrastructure	Bridge maintenance	10,000	10,000		12,000	12,000	12,000	12,000		Rail painting, joint sealant, etc
158	58-11	Infrastructure	Main St Bridge: design	115,000	144,000							Design for Main Street Bridge, City commitment
159	58-11	Infrastructure	Main St Bridge: non-eligible modifications design	25,000								Conduit design
160	58-11	Infrastructure	Main St Bridge: non-eligible modifications		250,000							Decorative lighting & lighting conduit installation
161	58-11	Infrastructure	Cady Street Bridge: rehab design									Design of Rehabilitation of Cady Street Bridge to extend useful service life
162	58-11	Infrastructure	Cady Street Bridge: rehab	100,000								Rehabilitation of Cady Street Bridge to extend useful service life
163	58-11	Infrastructure	TAP Grant: Tivoli Island bridge study	6,400								City portion is 20% (note: 100% charge, 80% reimb in same year)
164	58-11	Infrastructure	Lower Dam Phase III				550,000					Concrete repair at tainter gate
165	58-11	Infrastructure	Seawall	50,000	65,000		70,000	75,000	80,000	85,000		
166	58-11	Infrastructure	River Plaza: Phase II		430,000							Plaza including ramp, sidewalk, lighting
167	58-11	Infrastructure	TAP Grant: bike/pedestrian master plan	20,000								City portion is 20% (note: 100% charge, 80% reimb in same year)
168	58	Parking Lots	Park Maintenance Building (Bonner St): pave lot		50,000							Surface course was never laid; base course is starting to degrade
169	58	Parking Lots	Grinwald Park (Milford St): pave lot		120,000							A lot of use; painted parking stalls will help traffic flow
170	58	Parking Lots	Senior Center: resurfacing (bid w/ annual streets)	115,000								Pot holes and cracking, hazard for senior citizens
171	58	Parking Lots	Senior Center: expand south to Milwaukee St.								35,000	Not enough parking for popular events - bingo, voting, rentals
172			INFRASTRUCTURE Subtotal	2,296,702	2,879,000		2,406,000	1,853,000	1,858,000	97,000	35,000	
173		**ECONOMIC DEVELOPMENT**										
174	60-50		Amtrak station: land acquisition					X				
175	60-50		Highway A: certified survey map		Incl in bdgt							
176	60-50		Highway A: Phase 1 environmental assessment		Incl in bdgt							
177	60-50		Highway A: Phase 1A archeological assessment		20,000							
178			ECONOMIC DEVELOPMENT Subtotal	-	20,000		-	-	-	-	-	
179												
180			**FUND 01 TOTAL**	**4,313,000**	**4,398,000**		**18,141,000**	**6,053,000**	**3,328,000**	**1,963,000**	**1,665,000**	
181			Excess if target = $4,000,000 (incl $600K fire sta design)	313,000								
182			Excess if target = $3,000,000	1,313,000	1,398,000		2,641,000	3,053,000				
183			"Authorize" totals		320,000		420,000					
184			Excess if target = $3,000,000 plus pre-authorizations		658,000		1,901,000					
185			Total excluding fire station	3,713,000			5,641,000					
186												

City of Watertown - Capital Improvements 2024-2028				Funded								
		Rev: 230706		Not funded								
LINE		DEPARTMENT	PROJECT/PURCHASE DESCRIPTION	2023	2024	COMMENT	2025	2026	2027	2028	Future	REASON/NEED
187		SOLID WASTE - FUND 17										
188	58-17	Solid Waste	Refuse truck	AUTHORIZE >>	340,000			365,000			375,000	Replace w/ automated truck; existing truck is 2007 w/ 80,000 miles/10,000 hours
189	58-17	Solid Waste	Building: façade, roof repairs, plumbing, electrical		67,000							Per Facility Condition Assessment
190	58-17	Solid Waste	Building: façade, roof repairs, HVAC, electrical				290,000					Per Facility Condition Assessment
191	58-17	Solid Waste	Building: plumbing, fire protection, electrical, fire alarm					50,000				Per Facility Condition Assessment
192	58-17	Solid Waste	Building: roof repairs, site pavement						381,000			Per Facility Condition Assessment
193			**SOLID WASTE - FUND 17 Total**	**-**	**407,000**		**290,000**	**415,000**	**381,000**	**-**	**375,000**	
194												
195												
196		STORMWATER - FUND 16										
197	58-16	Stormwater	Storm Structures for Annual Street Construction Projects?	662,620	250,000		250,000	250,000	250,000			Annual placeholder
198	58-16	Stormwater	Pavement	110,000	110,000							
199	58-16	Stormwater	SW retrofits/maintenance (Best Management Practices)	Incl in Bdgt	Incl in Bdgt		Incl in Bdgt	Incl in Bdgt	Incl in Bdgt			
200	58-16	Stormwater	2024-25 CIP Design	50,000	50,000							
201	58-16	Stormwater	WisDOT BIL program design fees for Dewey Avenue	40,000	30,000							1/4 to Storm, 3/4 to Annual Streets
202	58-16	Stormwater	WisDOT design fees for Downtown Main Street	10,000	10,000							1/4 to Storm, 3/4 to Annual Streets
203	58-16	Stormwater	Hart Street Storm BMP (study/design)	70,000								Potential carry-over depending on flood study deliverables
204	58-16	Stormwater	Hart Street Storm BMP (construction)					2,000,000				
205	58-16	Stormwater	Total Maximum Daily Load (TMDL) implementation	25,000	90,000		120,000	120,000	120,000	120,000		
206	58-16	Stormwater	WinSLAMM Model and Training				30,000					
207	58-16	Stormwater	Storm System Cleaning - contracted out		200,000		200,000	200,000	200,000	200,000		Redirection of focus here
208	58-16	Stormwater	Excavator: rubber-tracked large mini		115,000							Replace 2008 unit w/ 4200 hours; shared w/ Streets (total= $130K)
209	58-16	Stormwater	Chipper		55,000							50/50 cost share w/ Streets (total = $110K)
210	58-16	Stormwater	Permeable paver maintenance equipment PaveVac		50,000							
211	58-16	Stormwater	Pipe trash racks: design ('23), construct ('24)	20,000	80,000							
212	58-16	Stormwater	Street sweeper	282,775					400,000			
213	58-16	Stormwater	Track excavator						200,000			
214	58-16	Stormwater	Truck: tandem-axle dump with plow/sander	AUTHORIZE >>			150,000					50/50 cost share w/ Streets (total = $300K)
215	58-16	Stormwater	Brine equipment		100,000							Working w/ Streets to define program
216	58-16	Stormwater	Quarry Study	40,000								Share w/ Parks & Streets (total = $120K)
217	58-16	Stormwater	Riverside Park Creek (Study)		60,000							
218	58-16	Stormwater	Riverside Park Creek (Stabilization)				300,000	300,000				Dodge Co working on study ('23)
219	58-16	Stormwater	Yardwaste - Biofilter (Design)	45,000								
220	58-16	Stormwater	Yardwaste - Biofilter (Construction)		300,000							
221			**STORMWATER - FUND 16 Total**	**1,355,395**	**1,500,000**		**1,050,000**	**2,870,000**	**1,170,000**	**320,000**	**-**	
222			"Authorize" totals				150,000					

Water Utility Capital Planning

Project/Purchase Description	2024	2025	2026	2027	2028
Annual streets & utilities watermain replacement program # 03-99-99-99	1,058,775	650,000	1,000,000	500,000	500,000
Annual IT - GIS / SCADA / asset management & data processing #03-99-99-99	30,000	30,000	30,000	30,000	30,000
Total Repair & Replace (see itemized listing) # 03-99-99-98	170,000	690,000	579,000	575,000	495,000
Total Capital Projects	*1,258,775*	*1,370,000*	*1,609,000*	*1,105,000*	*1,025,000*
2024					
Annual well renovation and pump work (wells 5&6)	100,000				
Annual hydrant painting	20,000				
Central raw reservior (inspection analysis)	50,000				
2025					
Annual hydrant painting		20,000			
Well VFD's		50,000			
WTP (new roof)		170,000			
West Street Watertower paint job (interior / exterior)		350,000			
NETP asphalt / driveway mill and pave		100,000			
2026					
Annual well renovation and pump work (well 9?)			100,000		
Annual hydrant painting			20,000		
Hospital Drive / interior paint job (pending ROV inspection)			250,000		
NE WTP meter relocation			34,000		
Watermain upsize - NE under HWY 16			150,000		
METER VAN			25,000		
2027					
Annual well renovation and pump work (1 or 2 pumps)				100,000	
Annual hydrant painting				20,000	
Airpark Drive exterior paint job				250,000	
WTP new roof				80,000	
Watermain loop projects (Highway 16 Bypass)				125,000	
2028					
Annual well renovation and pump work (1 or 2 pumps)					100,000
Annual hydrant painting					20,000
Western Tower exterior paint job					250,000
Watermain loop projects (Concord - Humboldt)					125,000

2024 Watermain projects (est. @ $175 / ft; does not include bituminous surface)		Lead services
Oconomowoc Ave (Kossuth St to East Gate Dr) [3,125']	550,000	0
S. Eleventh St. (Western Ave to Wisconsin St) [575']	210,000	2
S. Twelfth St. (Western Ave to Wisconsin St) [715']	125,250	5
William Ct (S Twelfth to Termini) [275']	50,000	0
Bituminous surfacing contribution (8.5% of the 1/3 cost total of est. $200 / LF)	moved to WW	
2024 project contingincy cost (above streets)	93,525	
2024 Engineering desing costs (for 2024 projects - Dewey Ave)	30,000	
		7
2024 Total - ESTIMATE ONLY	**$1,058,775**	

Account number:

03-99-99-98	$170,000
03-99-99-99	**$1,088,775**

Wastewater Utility Capital Planning

Project/Purchase Description	2024	2025	2026	2027
Annual streets & utilities sewermain replacement projects (below) # 02-97-30-11	295,000	300,000	300,000	300,000
Annual GIS / SCADA / asset management & data processing # 02-97-30-00	30,000	30,000	30,000	30,000
Total Capital & Repair - Replace (see itemized listing) - # 02-97-30-12	725,000	915,000	325,000	415,000
Total Capital Projects	*1,050,000*	*1,245,000*	*655,000*	*745,000*
2024				
Biosolids Process overhaul / dryer addition	200,000			
Emergency stand-by generator (Front St. & Watertown East)	100,000			
New fire alarm monitoring station (wwtp cmplex)	100,000			
Final Clarifier launder covers (2)	275,000			
Sanitary Sewer Collections System comprehensive plan update	50,000			
2025				
Replace mobile #4 generator pick-up		50,000		
Replace mobile #3 vehicle & plow		40,000		
Allerman lift station upgrade (based on study)		25,000		
Emergency stand-by generators (Grandview, Riverlawn & Carlson)		100,000		
Replace Screens (reduction of mesh size)		250,000		
Replace Camel - Jetter & vacuum truck (order in 2025 - pay for in 2026)		450,000		
2026				
Outdoor covered storage			80,000	
Emergency stand-by generators (Counrty Club, 18th Hole, South Concord)			150,000	
Replace lift station truck			80,000	
Heat Exchanger - polymer system			15,000	
2027				
Facilities Plan (electrical study)				200,000
Replace Dodge Journey				25,000
Replace mobile #9 pick-up/plow				40,000
Emergency stand-by generators (5th Ward, Oak Ridge, North Water)				150,000
2028				
WWTP Plant electrical controls upgrade (Plant 24 years old)				
Emergency stand-by generators (Fox Creek, Hintze, Riverside Park)				
Centrate pumps / transfer line rehab				

2024 Sewermain projects		
Bituminous surfacing contribution (100% (1/3 of the $175/LF)	25,000	*all cost from water - can manipulate this number*
CIPP project - footage + manholes to be determined later	250,000	
2024 project contingincy cost (above streets)	10,000	
2024 Engineering design costs (no contract yet, estimate only)	10,000	
2024 Total - ESTIMATE ONLY	**$295,000**	

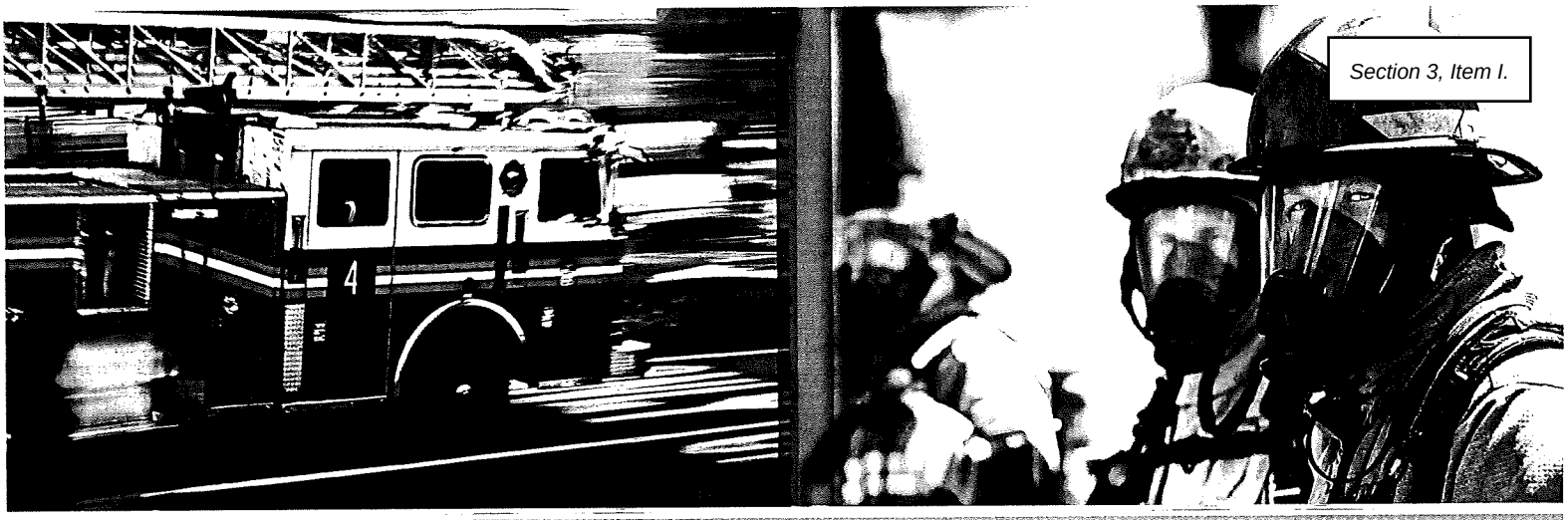
Account number:

02-97-30-00	$30,000	*GIS work*
02-97-30-11	$295,000	*infrastructure*
02-97-30-12	$675,000	*new equipment*

OPTICOM™ | Emergency Vehicle Preemption solutions

Change the way your city moves℠

GLOBAL TRAFFIC TECHNOLOGIES



OPTICOM™ HELPS TO SAVE LIVES AND PRESERVE RESOURCES

Emergency responders are the lifeline of their communities. Delays in arriving to the scene can put property and lives at risk. Even their own. That's why fire, EMS and police agencies choose Opticom Emergency Vehicle Preemption (EVP) solutions. GTT's reliable, scalable systems help to ensure safer, faster on-scene arrival—while maximizing resources and the investment.

Although capital budgets are sometimes scarce, there's a cost for doing nothing. Opticom helps make sure responders get to emergencies quickly and safely. With signal preemption, the likelihood of crashes can be reduced and responses can take less time. This all leads to better outcomes and savings.

REDUCE INTERSECTION CRASH RATES by up to **70%***

IMPROVE RESPONSE TIMES by up to **25%***

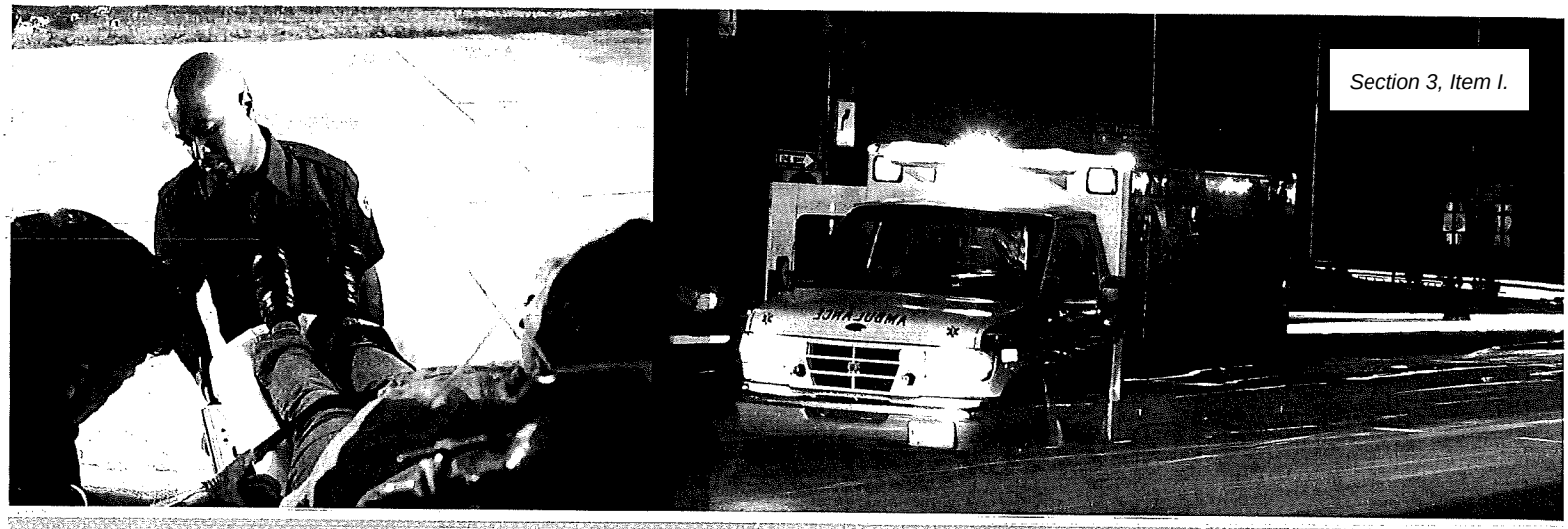
OPTICOM® BENEFITS

PREVENT INJURIES AND RELATED COSTS

OFFER QUICK PAYBACK ON YOUR INVESTMENT

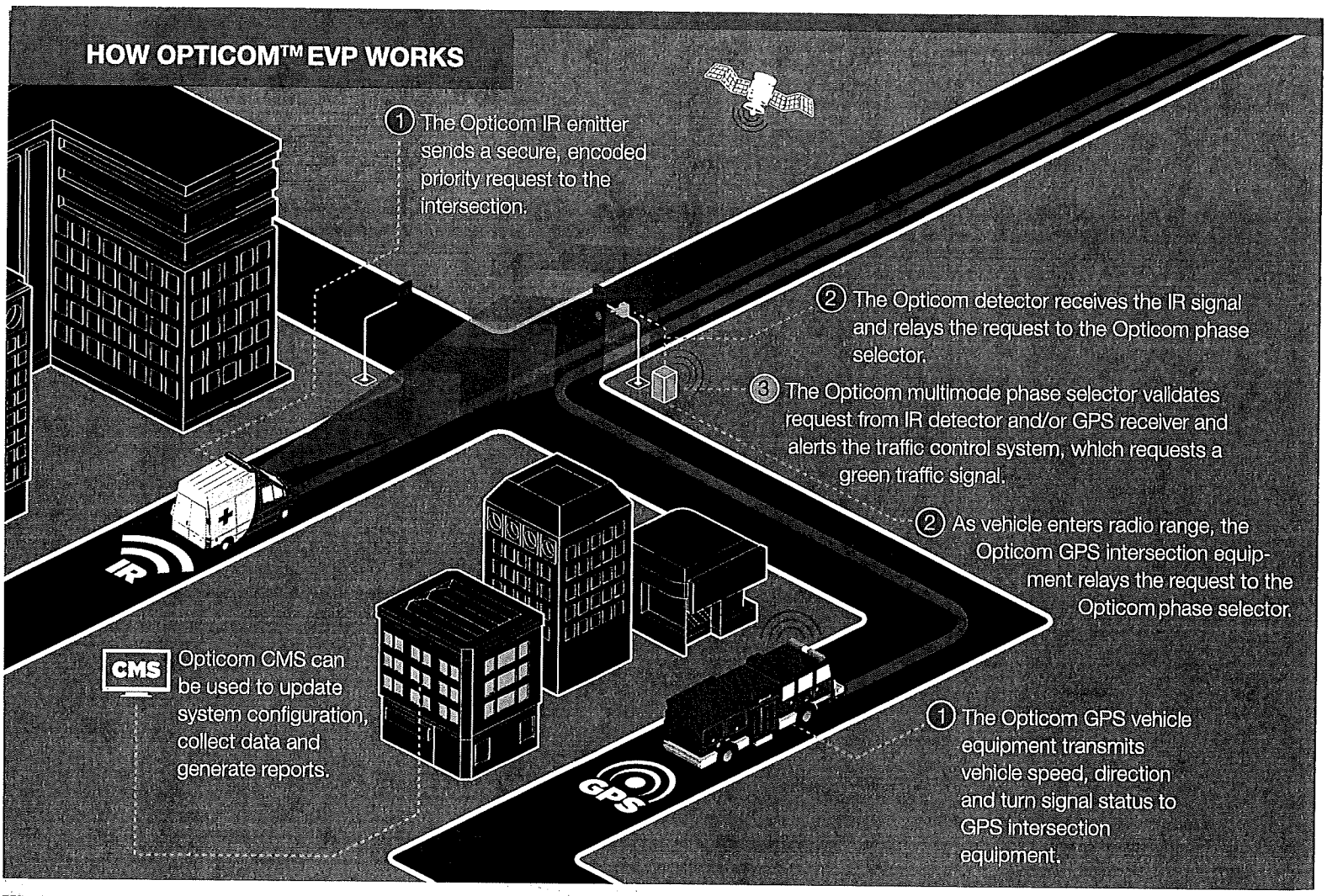
DECREASE LIABILITY FOR CRASHES WITH OTHER MOTORISTS

*Independent studies available upon request



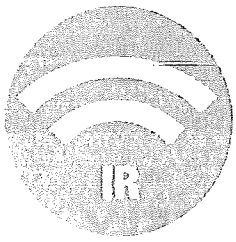
GET TO THE SCENE QUICKLY AND SAFELY.

Emergency vehicles using Opticom EVP request preemption from the traffic signal when responding to an emergency. Traffic is able to move out of the way for the emergency vehicle while cross traffic is stopped from entering the responders' path. The result is fewer crashes and faster arrivals. For a complete priority control system, Opticom EVP components are designed to coexist with Opticom Transit Signal Priority solutions.



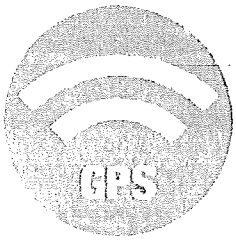
POWERFUL PLATFORMS ENABLE FASTER ARRIVALS

Whether you choose the legacy IR-based systems or the most technologically-advanced GPS-enabled platform, GTT's Opticom™ EVP solutions are built to meet the needs of departments of all sizes.



SINCE 1968

Legacy solution that uses coded infrared transmitters and receivers to enable EVP via line-of-sight.



SINCE 2002

Using powerful, precise algorithms and a purpose-built radio, the Opticom GPS-enabled system allows EVP over hills and around corners, even in poor weather conditions.

HOW THEY COMPARE	IR	GPS
Reduces intersection crash rates by up to 70%	●	●
Improves response times by up to 25%	●	●
Managed services available to keep system running optimally	●	●
Multimode operation for staggered upgrades and interoperability	●	●
Coded IR communications between vehicles and intersections	●	
Secure GPS and radio-enabled communications system		●
Ability to transmit and receive around corners and over hills		●
Minimal maintenance cost for vehicle and intersection equipment		●
Activate signal preemption based on estimated time of arrival or distance		●
Vehicle and intersection analytics for smarter operations		●
IntelliGreen system for a green light when leaving the station		●

TRAFFIC CONTROL CORPORATION
5651 MEMORIAL AVENUE
OAK PARK HEIGHTS, MN 55082
PHONE: 651-439-1737

QUOTATION

Number 652566

To: WTRTWN WI
WATERTOWN FIRE DEPT
106 JONES STREET
WATERTOWN WI 53904
USA

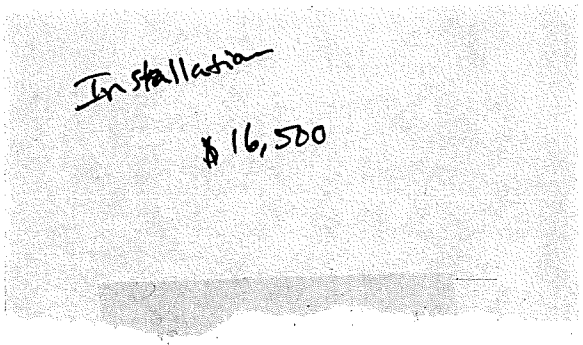
Attn:
Email:
Phone: **Fax:**

Quote Date: 6/8/2023 **Expires:** 8/7/2023
Terms: NET 30 BASED ON APPROVED CREDIT
FOB: DESTINATION-FRT INCLUDED
Salesperson: ALLEN EISINGER
Email: AEisinger@TCC1.com
Phone: 651-439-1737

Letting Date:
Book / Call / Item:
Contract No:

Location: WATERTOWN, WI
Description: APPLIED INFORMATION SYSTEM

Part Number / Description	Unit Price	Qty/UM	Net Price
APPLIED INFORMATION - FIELD MONITORING UNIT * SHELF MOUNT FMU WITH GLANCE PREEMPT & PRIORITY VIDEO CAPABILITY, 4 PORT ETHERNET SWITCH, CONFIGURATION & LICENSE INCLUDED * INCLUDES GLANCE SOFTWARE SYSTEM TRAINING	3,200.00	12.00 EA	38,400.00
CONNECTIVITY & GLANCE CLOUD APPLICATION 10 YEAR SERVICE EXCLUDES VIDEO * INTERSECTION CONNECTIVITY & SUPPORT FROM TCC & AI INCLUDES: * 10 YEARS OF SERVICE * GUARANTEED CONNECTIVITY WITH NO OVERAGE CHARGES * UPGRADE OF CELL MODEM WHEN TECHNOLOGY CHANGES * PHONE/EMAIL SUPPORT FROM AI * EXTENDED WARRANTY ON HARDWARE * OVER-THE-AIR SOFTWARE UPDATES * AI CONNECTED VEHICLE SERVICE - "TRAVELSAFELY"	3,150.00	27.00 EA	85,050.00
VPU - VEHICLE PREEMPT UNIT W/ GLANCE VPU - VEHICLE PREEMPT UNIT: APPLIED INFORMATION, AI-500-065 WITH GLANCE **DOES NOT INCLUDE INSTALLATION**	2,550.00	15.00 EA	38,250.00



TRAFFIC CONTROL CORPORATION
5651 MEMORIAL AVENUE
OAK PARK HEIGHTS, MN 55082
PHONE: 651-439-1737

QUOTATION

Number 652566

Part Number / Description	Unit Price	Qty/UM	Net Price
FIELD SERVICE	1,000.00	12.00 EA	12,000.00
TCC TECH TO INSTALL, CONFIGURE AND INTEGRATE APPLIED INFORMATION EQUIPMENT AND DRIVE TEST			

Item Total:	173,700.00
Misc Charges and Adjustments:	0.00
Quote Total:	**173,700.00**

Project: Vehicle Communcation System
Location: City of Watertown
Limits:

THE CITY OF WATERTOWN

Project: Vehicle Communcation System
Location: City of Watertown
Limits:

THE CITY OF WATERTOWN

Estimate Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Estimate Amount
0002	204.0100	1991 EACH	$6.23	$12,403.93
0004	204.0110	177 EACH	$1.50	$265.50
0006	204.0150 Removing Curb and Gutter	600 EACH	$3.25	$1,950.00
0008	204.0155 Removing Concrete Sidewalk	182 EACH	$5.64	$1,026.48
0010	204.0210 Removing Manholes	4 EACH	$777.00	$3,108.00

Estimated Subtotal:	$18,753.91
Contingencies:	
Estimated Total:	$18,753.91
Participating Construction	**#REF!**
Non-Participating Construction	**#REF!**

Participating Construction	
80% Federal	**#REF!**
20% Municipality	**#REF!**

Estimate Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Estimate Amount
0002	Onsite Service Call	1 EACH	$65.00	$65.00
0004	Installation Supplies	1 EACH	$50.00	$50.00
0006	Install Opticom in Apparatus	10 EACH	$115.00	$1,150.00
0008	OSPIC Card w/ Confirmation	1 EACH	$2,400.00	$2,400.00
0010	Detoc Detector w Light Removing Manholes	1 EACH	$1,720.00	$1,720.00
0012	Cable, Optical Detector	1 EACH	$600.00	$600.00
0014	Streetlight Installation	12 EACH	$10,000.00	$120,000.00
0016	First Year Start-up/Training	10 EACH	$4,000.00	$40,000.00

Estimated Subtotal:	$165,985.00
Contingencies:	
Estimated Total:	$165,985.00
Participating Construction	**#REF!**
Non-Participating Construction	**#REF!**

Participating Construction	
80% Federal	**#REF!**
20% Municipality	**#REF!**

w Vehicle Communcation System
Location: City of Watertown
Limits:

THE CITY OF WATERTOWN

Estimate Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Estimate Amount
0002	Onsite Service Call	1 EACH	$65.00	$65.00
0004	Installation Supplies	1 EACH	$50.00	$50.00
0006	Install Opticom in Apparatus	10 EACH	$115.00	$1,150.00
0008	OSPIC Card w/ Confirmation	1 EACH	$2,400.00	$2,400.00
0010	Detoc Detector w Light	1 EACH	$1,720.00	$1,720.00
	Cable, Optical Detector	1 EACH	$600.00	$600.00
	Streetlight Installation	1 12 UNITS	**$10,000.00**	**$120,000.00**
	First Year Start-up/Training	12 UNIT	**$4,000.00**	**$40,000.00**
			Estimated Subtotal:	$165,985.00
			Contingencies:	$0.00
			Estimated Total:	$165,985.00
			Participating Construction	**#REF!**
			Non-Participating Construction	**#REF!**

Participating Construction	
80% Federal	**$132,788.00**
20% Municipality	**$33,197.00**

Review and take possible action: Approve submittal of WisDOT Carbon Reduction Grant for Fire Department Vehicle-to-Infrastructure Communications System

Wisconsin Department of Transportation (WisDOT) offered a new grant program this year to assist communities in reducing air pollution through transportation improvement systems. City staff evaluated the WisDOT Carbon Reduction Grant and identified a vehicle-to-infrastructure communications system for the Fire Department to apply for. The proposed project would include communications equipment to reduce emissions, improve traffic flow and improve safety. The system will allow emergency vehicles to communicate with stoplights to allow emergency vehicles to travel with the flow of traffic.

The proposed equipment would retrofit 10 fire department trucks and ambulances. 12 streetlights will be outfitted with the communications equipment to receive information from the trucks and ambulances. The cost of installation has been included in the overall grant application total.

The Carbon Reduction Grant offers an 80% state cost share. Costs in 2023 have been reduced due to promotional incentives. The 2023 overall cost is quoted at $55,985.00. A WisDOT Carbon Reduction Grant would pay for 80% of this cost ($44,788.00), with the City being responsible for $20 cost-share of $11,197.00. The City's share is proposed to come out of one of the following accounts:

- 2% Fire Dues [$98,780 balance]- under the provision of "purchase of fire protection equipment"
- WI DHS Funding Assistance Program (FAP) ARPA Supplement [$24,390]- unplanned receipt of funding required to be spent by August 31. Funds must follow FAP eligibilities which includes "non-routine safety upgrades to existing vehicles" and the wide category of "communications."
- ARPA interest earnings
- General Fund balance

Without this grant or the promotional incentives, the overall cost of purchasing and installing this equipment is quoted at over $190,000.

The Fire Department seeks approval of a resolution to apply for this grant opportunity with the Mayor identified as the authorized representative of the City.

Travis Teesch

From: Pope, Larry <larry.pope@gtt.com>
Sent: Thursday, April 6, 2023 4:33 PM
To: Travis Teesch
Subject: Pricing of Cloud preemption with Whelen VSG

Travis,
Sorry for the delayt but I wanted to give you as accurate of price for the cloud as possible.
There are several ways to deploy the preemption as we discussed yesterday. Earlier today I gave you an estimate based on a distributed gps deployment where I estimated the costs based on historical knowledge and I think it came in around:

1. Option 1 (GPS), no cloud, no Whelen, no communications from the vehicle, or to the intersection necessary.

12 intersections x 10K/intersection= $120K
10 vehicles x 4K/vehicle= 40K
$160K

(Whelen VSG doesn't figure in Option 1, nor are there any annual fees)

The other 2 options, both utilized Whelen and are cloud based. They provide communications from the vehicle (via Whelen, and communications to the intersection)

1. Option A- Full CapX purchase. No annual fees, and all cloud.
   Same configuration as above Approx $228K and is a 10 yr contract.

2. Option B- Annual fee for 10 yrs at approx. $26K/yr

In all instances, everything necessary for preemption is included in these prices.
Hope this help. Please call with questions.

larry

Larry Pope
Regional Manager
Cell 651- 245-8709
Larry.pope@gtt.com

monthly service included

Global Traffic Technologies, LLC.
7800 Third Street North, Bldg 100
St. Paul, MN 55128-5441
United States
www.gtt.com

***For Customer Support, please contact: CustomerCare@GTT.com, or phone (800) 258-4610.

PROJECT SPECIFICATION MANUAL

City of Watertown
Riverside Park Restroom
600 Labaree Street
Watertown, WI 53098
06/30/2023

Prepared by Architect of Record:

THRIVE ARCHITECTS

TABLE OF CONTENTS
City of Watertown – Riverside Park Restroom
600 Labaree Street, Watertown, Wisconsin 53098

SECTION 01 10 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Work under other contracts.
5. Products ordered in advance.
6. Owner-furnished products.
7. Use of premises.
8. Owner's occupancy requirements.
9. Work restrictions.
10. Specification formats and conventions.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Watertown Riverside Park Restroom

1. Project Location: 600 Labaree Street, Watertown, WI 53098

B. Owner: City of Watertown

1. Owner's Representative: Engineering Projects Manager Ritchie Piltz

C. Architect: Thrive Architects, LLC, 259 South St., Ste A, Waukesha, WI 53186

D. Contractor: TBD

E. The Work consists of the following:

1. The Work includes a public restroom building, of approximately 1,600sf, and related site work. The building is to be constructed of CMU, with wood framed trusses on concrete

footings and foundations. The work includes all associated mechanical, electrical, and plumbing as indicated. The building is unheated and will be winterized.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment.

B. Owner-Furnished Products:

1. Fire Extinguisher for Utility Room

2. Soap Dispensers

1.6 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, except otherwise approved by authorities having jurisdiction. This project lies in a noise sensitive area. In order to abate objectionable

noise to the extent feasible, motorized construction equipment shall not be operated between the hours of 9:00 PM and 7:00 AM without the prior written approval of the OWNER'S REPRESENTATIVE. Each item of motorized construction equipment shall be equipped with a muffler constructed according to the equipment manufacturer's specifications or a system of equivalent noise reducing capability. Mufflers and exhaust systems shall be maintained in good operating condition, free from leaks and holes.

1. Weekend Hours: as approved.
2. Early Morning Hours: as approved.
3. Hours for Utility Shutdowns: as approved.
4. Hours for noisy activity: as approved.

B. Existing Utility Interruptions: Do not interrupt utilities serving neighboring facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.10 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

Alternate No. 1: Bumped up roof element as illustrated on A1.3, A2.1, A3.0, & A3.1, with siding and roofing to match the base building.

END OF SECTION 01 23 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F or C.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.6 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
b. Fortifiber Building Systems Group; Moistop Ultra [15] [10].
c. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
d. Insulation Solutions, Inc.; Viper VaporCheck II, 15 mil.
e. Meadows, W. R., Inc.; Perminator 15 mil.
f. Raven Industries Inc.; Vapor Block 15.
g. Reef Industries, Inc.; Griffolyn Type-105.
h. Stego Industries, LLC; Stego Wrap 15 mil Class A.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ChemMasters; Chemisil Plus.
b. ChemTec Int'l; ChemTec One.
c. Conspec by Dayton Superior; Intraseal.
d. Curecrete Distribution Inc.; Ashford Formula.
e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
f. Edoco by Dayton Superior; Titan Hard.
g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
h. Kaufman Products, Inc.; SureHard.
i. L&M Construction Chemicals, Inc.; Seal Hard.
j. Meadows, W. R., Inc.; LIQUI-HARD.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group; Duro-Nox.
m. Symons by Dayton Superior; Buff Hard.
n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear

B. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Floor Products; Retro-Plate 99.
b. L&M Construction Chemicals, Inc.; FGS Hardener Plus.
c. QuestMark, a division of CentiMark Corporation; DiamondQuest Densifying Impregnator Application.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:

a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
b. BASF Construction Chemicals - Building Systems; Confilm.
c. ChemMasters; SprayFilm.
d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; Vapor-Aid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover:AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. BASF Construction Chemicals - Building Systems; Kure 200.
c. ChemMasters; Safe-Cure Clear.
d. Conspec by Dayton Superior; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
f. Edoco by Dayton Superior; Res X Cure WB.
g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
h. Kaufman Products, Inc.; Thinfilm 420.
i. Lambert Corporation; AQUA KURE - CLEAR.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.
l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.
n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi (31.1 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.40.
3. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
4. Air Content: 4.5 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4500 psi (20.7 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5000 psi at exterior slab on grade and 4000 psi at interior slab on grade at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.50 for interior slabs on grade & 0.4 for exposed slabs on grade.
3. Minimum Cementitious Materials Content: 540 lb/cu. yd.
4. Slump Limit: 3 inches, plus or minus 1 inch.
5. Air Content: 6 percent at exterior slab on grade, plus or minus 1 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

C. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

1. Place and compact a 1/2-inch- thick layer of fine-graded granular material over granular fill.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete

when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

3.11 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than three days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:
1. Verification of use of required design mixture.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain four composite sample for each 50 cu. yd. (38 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

3.15 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Decorative concrete masonry units.
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. Division 07 Section "Water Repellents" for water repellents applied to unit masonry assemblies.
2. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
3. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.
4. Division 32 Section "Segmental Retaining Walls" for dry-laid, concrete unit retaining walls.

C. Products furnished, but not installed, under this Section include the following:
1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 05 Section "Structural Steel Framing."

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry by testing masonry prisms according to ASTM C 1314.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units/Architectural Cast Stone: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:

1. Decorative concrete masonry units, in the form of small-scale units.
2. Colored mortar.
3. Weep holes/vents.

D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

E. Qualification Data: For testing agency.

F. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
d. For surface-coated brick, include material test report for durability of surface appearance after 50-cycles of freezing and thawing per ASTM C 67.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for each type of exposed unit masonry column and each typical decorative CMU wall in sizes approximately 48 inches long by 96 inches high by full thickness, including face and backup wythes and accessories.

a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.

b. Include lower corner of window opening framed with stone trim at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
d. Include veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.

2. Clean exposed faces of mockups with masonry cleaner as indicated.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

a. Products:

1) Addiment Incorporated; Block Plus W-10.
2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
3) Master Builders, Inc.; Rheopel.
4) Approve Product**.**

C. Concrete Masonry Units: ASTM C 90.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Weight Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture as indicated in the Materials Schedule.

D. Decorative Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 200 psi.
2. Weight Classification: Medium weight.

3. Size (Width): Manufactured to dimensions specified in "Concrete Masonry Units" Paragraph above.
4. Pattern and Texture:
   a. Standard pattern, split-face finish.
5. Colors: As indicated in the Materials Schedule**.**

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Masonry Cement: ASTM C 91.

1. Products:

   a. Capital Materials Corporation; Flamingo Color Masonry Cement.
   b. Essroc, Italcementi Group; Brixment or Velvet.
   c. Holcim (US) Inc.; Mortamix Masonry Cement.
   d. Lafarge North America Inc.; Lafarge Masonry Cement.
   e. Lehigh Cement Company; Lehigh Masonry Cement.
   f. National Cement Company, Inc.; Coosa Masonry Cement.
   g. Or Equal

E. Mortar Cement: ASTM C 1329.

1. Products:

   a. Lafarge North America Inc.; Lafarge Mortar Cement.
   b. Or Equal

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products:

   a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
   b. Davis Colors; True Tone Mortar Colors.
   c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
   d. Or Equal

G. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Products:

    a. Colored Portland Cement-Lime Mix:

        1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
        2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
        3) Lafarge North America Inc.; Eaglebond.
        4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
        5) Or Equal

H. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C 404.

J. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.

K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products:

    a. Addiment Incorporated; Mortar Kick.
    b. Euclid Chemical Company (The); Accelguard 80.
    c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
    d. Sonneborn, Div. of ChemRex; Trimix-NCA.
    e. Or Equal

L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Products:

    a. Addiment Incorporated; Mortar Tite.
    b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

c. Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.
d. Or Equal

M. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
5. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet**,** with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multi wythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.
2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.

6. Stainless-Steel Sheet: ASTM A 666, Type 304.
7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
8. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, [hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.

D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

E. Stone Anchors: Fabricate dowels, cramps, and other stone anchors from stainless steel.

F. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.
b. Anchor Section: Sheet metal plate, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom and with raised rib-stiffened strap, 5/8 inch wide by 3-5/8 inches long, stamped into center to provide a slot between strap and plate for inserting wire tie.
c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch-diameter, hot-dip galvanized steel wire.
d. Products:

1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213.
2) Heckmann Building Products Inc.; 315-D with 316.

3) Hohmann & Barnard, Inc.; DW-10.
4) Wire-Bond; 1004, Type III.
5) Approved Product.

2.7 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Post installed Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing**,** where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual Division 07 Section "Sheet Metal Flashing and Trim" and as follows:
1. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq. ft. weight or 0.0216 inch thick elsewhere.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

a. Products:

1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
3) Or Equal.

4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
5. Fabricate through-wall flashing with drip edge**,** unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

6. Fabricate through-wall flashing with sealant stop**,** unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
7. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
8. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
9. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
10. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.

B. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

    a. Products:

        1) Advanced Building Products Inc.; Copper Fabric Flashing.
        2) AFCO Products Inc.; Copper Fabric.
        3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
        4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
        5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
        6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
        7) York Manufacturing, Inc.; York Copper Fabric Flashing.
        8) Or Equal.

2. Asphalt-Coated Copper Flashing: 7-oz./sq. ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.

    a. Products:

        1) Advanced Building Products Inc.; Cop-R-Cote.
        2) AFCO Products Inc.; Cop-A-Cote.
        3) Hohmann & Barnard, Inc.; H & B C-Coat Flashing.
        4) Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
        5) Polytite Manufacturing Corp.; Coated Copper Flashing.
        6) Sandell Manufacturing Co., Inc.; Coated Copper Flashing.
        7) York Manufacturing, Inc.; Copperseal.
        8) Or Equal.

3. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.

    a. Products:

1) Advanced Building Products Inc.; Peel-N-Seal.
2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
6) Hohmann & Barnard, Inc.; Textroflash.
7) Polyguard Products, Inc.; Polyguard 300.
8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
9) Williams Products, Inc.; Everlastic MF-40.
10) Or Equal.

4. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:

a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive.
c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.

1) Color: Stock color to be approved by owner.

d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
e. Products:

1) Hyload, Inc.; Hyload Cloaked Flashing System.
2) Or Equal.

5. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.

a. Products:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
4) Or Equal.

C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high-density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing pans have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging with mortar.

1. Product: Subject to compliance with requirements, provide "Blok-Flash" by Advanced Building Products Inc.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use one of the following, unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

a. Products:

1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
2) Or Equal.

2. Aluminum Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Division 09 painting Sections in color approved by Architect to match that of mortar.

a. Products:

1) Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.

2) Or Equal.

3. Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection-molded PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color approved by Architect to match that of mortar.

a. Products:

1) Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
2) Williams Products, Inc.; Williams-Goodco Brick Vent.
3) Wire-Bond; Louvered Weepholes.
4) Or Equal.

E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Products:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
e. Or Equal.

2.10 MASONRY-CELL INSULATION

A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

2.11 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.
d. Approved Manufacturer.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S or N.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.

F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.

2.13 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by from Testing and Inspecting Allowance, as authorized by Change Orders.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.

C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 -

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set precast concrete trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

   a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

   a. Where bed joints of both wythes align, use la-type reinforcement extending across both wythes.
   b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not over 8 inches clear horizontally and 16 inches clear vertically.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 8 inches o.c.
2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.

3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

    a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten anchors to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal

penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches ; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
6. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
7. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
8. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
9. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c., unless otherwise indicated.
4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
5. Trim wicking material flush with outside face of wall after mortar has set.

F. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than 24 inches above top of pea gravel.

G. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

3.12 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made from Testing and Inspecting Allowance, as authorized by Change Orders.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

F. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

H. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.

3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.15 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with timber.
3. Framing with engineered wood products.
4. Wood blocking and nailers.
5. Plywood backing panels.

B. Related Sections include the following:

1. Division 06 Section "Sheathing."
2. Division 06 Section "Shop-Fabricated Wood Trusses."

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat all rough carpentry, unless otherwise indicated**.**

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping**,** and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 plywood).

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

D. Application: Treat items indicated on Drawings, and the following**:**

1. Framing for raised platforms.
2. Concealed blocking.
3. Framing for non-load-bearing partitions.
4. Framing for non-load-bearing exterior walls.
5. Roof construction.
6. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 15 percent.

B. Non-Load-Bearing Interior Partitions: Construction, stud or No. 2 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB, or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Northern species; NLGA.
7. Eastern softwoods; NeLMA.

8. Western woods; WCLIB or WWPA.

C. Exterior and Load-Bearing Walls: Any species and grade with a modulus of elasticity of at least 1,300,000 psi and an extreme fiber stress in bending of at least 1300 psi for 2-inch nominal thickness and 6-inch nominal width for single-member use.

D. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 1,300,000 psi and an extreme fiber stress in bending of at least 1300 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.5 TIMBER FRAMING

A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
1. Species and Grade: Southern pine, Select Structural grade; SPIB.
2. Maximum Moisture Content: 20 percent.
3. Additional Restriction: Free of heart centers.

2.6 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boise Cascade Corporation.
b. Finnforest USA.
c. Georgia-Pacific.
d. Louisiana-Pacific Corporation.
e. Pacific Woodtech Corporation.
f. Roseburg Forest Products Co.
g. Weldwood of Canada Limited; Subsidiary of International Paper Corporation.
h. Weyerhaeuser Company.
i. Approved Manufacturer.

2. Extreme Fiber Stress in Bending, Edgewise: 2600 psi for 12-inch nominal- depth members.
3. Modulus of Elasticity, Edgewise: 2,000,000 psi.

B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Weyerhaeuser Company.
   b. Approved manufacturer.

2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal- depth members.
3. Modulus of Elasticity, Edgewise: 2,000,000 psi.

2.7 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

   1. Blocking.
   2. Nailers.
   3. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any of the following species:

   1. Hem-fir (north); NLGA.
   2. Mixed southern pine; SPIB.
   3. Spruce-pine-fir; NLGA.
   4. Hem-fir; WCLIB, or WWPA.
   5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
   6. Western woods; WCLIB or WWPA.
   7. Northern species; NLGA.
   8. Eastern softwoods; NeLMA.

C. For exposed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

   1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
   2. Mixed southern pine, No. 1 grade; SPIB.
   3. Hem-fir or hem-fir (north), Select Merchantable or No. 1 Common grade; NLGA, WCLIB, or WWPA.
   4. Spruce-pine-fir (south) or spruce-pine-fir, Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

   1. Mixed southern pine, No. 2 grade; SPIB.
   2. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
   3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

4. Eastern softwoods, No. 2 Common grade; NeLMA.
5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.8 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.9 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.10 METAL FRAMING ANCHORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.
2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Simpson Strong-Tie Co., Inc.
6. Southeastern Metals Manufacturing Co., Inc.
7. USP Structural Connectors.
8. Approved Manufacturer**.**

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G90 coating designation.

1. Use for interior locations where stainless steel is not indicated.

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Use for exterior locations and where indicated.

E. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.050 inch.

2.11 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.

K. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable.
2. Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs. Fasten plates to supporting construction, unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal- size wood studs spaced 16 inches o.c., unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-4-inch nominal- size wood studs spaced 16 inches o.c., unless otherwise indicated.
3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

D. Provide diagonal bracing in exterior walls, at both walls of each external corner, at 45-degree angle, full-story height, unless otherwise indicated. Use 1-by-4-inch nominal- size boards, let-in flush with faces of studs.

3.4 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to 3 joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.5 TIMBER FRAMING INSTALLATION

A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.

C. Install wood posts using metal anchors indicated.

D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.6 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 15 00 - WOOD DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Solid-sawn roof decking.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for dimension lumber items associated with wood decking.

1.3 SUBMITTALS

A. Product Data:

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treatment plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

a. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before further fabrication or shipment to Project site.

2. For sealant and installation adhesive.

a. Include manufacturer's printed statement of VOC content.

B. Samples: 24 inches long, showing the range of variation to be expected in appearance of wood decking.

C. Certificates of Chain-of-Custody: Signed by manufacturers certifying that wood used to produce wood decking was obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria." Include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.

D. Research/Evaluation Reports: For glued-laminated wood decking indicated to be of diaphragm design and construction.

1.4 QUALITY ASSURANCE

A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112, "Standard for Tongue-and-Groove Heavy Timber Roof Decking."

B. Forest Certification: Provide wood decking produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking with surfaces that are to be exposed in the final work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. General: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Grade Stamps: Provide solid-sawn wood decking with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, species, grade, moisture content at time of surfacing, and mill. Apply grade stamp to surfaces that will not be exposed to view.

C. Moisture Content: Provide wood decking with 15 percent maximum moisture content at time of dressing.

D. Preservative Treatment: Pressure treat solid-sawn wood decking according to AWPA C31 with inorganic boron (SBX) and redry wood to 15 percent maximum moisture content.

E. Preservative Treatment: Where preservative-treated laminated decking is indicated, pressure treat lumber before gluing according to AWPA C28 for aboveground use.

1. Use oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
2. Use copper naphthenate in a light petroleum solvent.
3. Use ammoniacal copper zinc arsenate (ACZA) or chromated copper arsenate (CCA) in a water solution and redry wood to 15 percent maximum moisture content.

4. Use preservative solution without substances that might interfere with application of indicated finishes.

2.2 SOLID-SAWN WOOD DECKING

A. Decking Species: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), hem-fir, hem-fir (North), southern pine, spruce pine-fir (North), western hemlock, or western hemlock (North), western cedar.

B. Decking Nominal Size: 2x6.

C. Decking Grade: Selected Decking.

D. Decking Grade: Dense Standard and/or Dense Select Decking.

E. Face Surface: Rough sanded, wire brushed, Saw textured, or Smooth.

F. Edge Pattern**: Beaded edge, Bullnosed, Channel grooved, or Vee grooved.**

2.3 FASTENERS AND ACCESSORY MATERIALS

A. Fasteners for Solid-Sawn Decking: Provide fastener size and type complying with decking standard for thickness of deck used.

B. Fasteners for Glued-Laminated Decking: Provide fastener size and type complying with requirements for installing laminated decking in Part 3 "Installation" Article.

C. Fastener Material: Hot-dip galvanized or Stainless steel.

D. Installation Adhesive: For glued-laminated wood decking indicated to be of diaphragm design and construction, provide adhesive that complies with research/evaluation report.

1. Use adhesive that complies with VOC limits of South Coast Air Quality Management District Rule #1168.

E. Sealant: Elastomeric joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

1. Use sealant that meets or exceeds Bay Area Air Quality Management District Regulation 8, Rule 51.

F. Penetrating Sealer: Clear sanding sealer complying with Division 9 painting Sections and compatible with topcoats specified for use over it.

2.4 FABRICATION

A. Shop Fabrication: Where preservative-treated decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.

B. Fabricate decking in lengths for two-span continuous lay-up.

C. Predrill decking for lateral spiking to adjacent units to comply with referenced decking standard.

D. Seal Coat: After fabricating and surfacing decking, apply a saturation coat of penetrating sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and support framing in areas to receive wood decking for compliance with installation tolerances and other conditions affecting performance of wood decking.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install solid-sawn wood decking to comply with referenced standard and with end joints located according to lay-up indicated.

B. Install laminated wood decking to comply with manufacturer's written instructions and with end joints located according to lay-up indicated.

1. Nail each course of glued-laminated wood decking at each support with one nail slant nailed above the tongue and one straight nailed through the face.

a. Use 12d nails for 2x6 and 2x8 decking.
b. Use 30d nails for 3x6 and 3x8 decking.

2. Slant nail each course of glued-laminated wood decking to the tongue of the adjacent course at 30 inches o.c. and within 12 inches of the end of each unit. Stagger nailing in adjacent courses 15 inches.

a. Use 6d nails for 2x6 and 2x8 decking.
b. Use 8d nails for 3x6 and 3x8 decking.

3. Glue adjoining decking courses together by applying a 3/8-inch bead of adhesive on the top of tongues according to research/evaluation report.

C. Where preservative-treated decking must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

1. Use inorganic boron (SBX) treatment.
2. Use copper naphthenate treatment.

D. Apply joint sealant to seal roof decking at exterior walls at the following locations:

1. Between decking and supports located at exterior walls.
2. Between decking and exterior walls that butt against underside of decking.
3. Between tongues and grooves of decking over exterior walls and supports at exterior walls.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 PROTECTION

A. Provide temporary waterproof covering to protect exposed decking before applying roofing.

END OF SECTION 06150

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wall sheathing.
2. Roof sheathing.
3. Building paper.
4. Building wrap.
5. Sheathing joint-and-penetration treatment.
6. Flexible flashing at openings in sheathing.

B. Related Sections include the following:

1. Division 06 Section "Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
6. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.
4. Building wrap.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA C9.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 EXTERIOR WALL SHEATHING @ GABLE ENDS

A. Plywood Wall Sheathing: APA Rated, Exterior Exposure 1**,** sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 7/16 inch.

B. Oriented-Strand-Board Wall Sheathing: APA Rated, Exposure 1 sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 7/16 inch.

2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: APA Rated, Exposure 1, sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 5/8 inch.
3. Provide plywood panel sheathing clips.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.

2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.6 WEATHER-RESISTANT SHEATHING PAPER

A. Building Paper: Not Used

B. Building Wrap: Tyvek CommercialWrap or equal.

C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by insulation manufacturer for sealing joints and penetrations in exterior insulation.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Not Used

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.025 inch.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing, Vycor V40 Weather Barrier Strips.
c. MFM Building Products Corp.; Window Wrap.
d. Polyguard Products, Inc.; Polyguard 300.
e. Protecto Wrap Company; BT-20 XL or PS-45.
f. Approved Product.

C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
4. Table 2305.2, "Fastening Schedule," in BOCA's "BOCA National Building Code."
5. Table 2306.1, "Fastening Schedule," in SBCCI's "Standard Building Code."
6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's "International One- and Two-Family Dwelling Code."

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to

exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.3 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least, except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
4. Lap weather-resistant building paper over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 06 16 00

SECTION 06 17 53 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

B. Related Sections include the following:

1. Division 06 Section "Sheathing" for roof sheathing.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

B. TPI: Truss Plate Institute, Inc.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:

a. Roof Trusses: Vertical deflection of 1/240 of span.

1.5 SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer**.** Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.
6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

D. Qualification Data: For fabricator.

E. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

F. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Metal-plate connectors.
2. Metal truss accessories.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.

D. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 COORDINATION

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded as follows and of the following minimum design values for size of member required according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement":

1. Grading Method: Visual or mechanical.
2. Design Values: As indicated on Drawings.
3. Design Values: Modulus of elasticity of at least 1,800,000 psi and an extreme fiber stress in bending of at least 1800 psi.

C. Minimum Chord Size For Roof Trusses: 2 by 4 inches nominal for both top and bottom chords.

D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 06 Section "Rough Carpentry."

2.2 METAL CONNECTOR PLATES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpine Engineered Products, Inc.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
3. CompuTrus, Inc.
4. Eagle Metal Products.
5. Jager Building Systems, Inc.
6. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
7. Robbins Engineering, Inc.
8. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
9. Truswal Systems Corporation.
10. Approved Manufacturer.

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

1. Use for interior locations where stainless steel is not indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 304, and not less than 0.035 inch thick.

1. Use for exterior locations and where indicated.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.4 METAL TRUSS ACCESSORIES

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

1. Cleveland Steel Specialty Co.
2. Harlen Metal Products, Inc.
3. KC Metals Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. Southeastern Metals Manufacturing Co., Inc.
6. USP Structural Connectors.
7. Approved Manufacturer.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations where stainless steel is not indicated.

D. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Use for exterior locations and where indicated.

E. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall stud/framing below, 1-1/2 inches wide by 0.050 inch thick. Tie fastens to one side of truss, top plates, and side of stud/framing below**.**

F. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between 2 adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Division 06 Section "Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.

1. Do not alter trusses in field.

3.2 REPAIRS AND PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 06 17 53

SECTION 06 64 00 – PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide fiberglass reinforced plastic (FRP) panels for wall applications.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature including product characteristics, accessories and limitations.

B. Selection Samples: Submit samples of colors and finishes if requested by Architect.

C. Verification Samples: Submit samples of selected materials specified to verify color and finish.

D. Industry Certifications and Standards: Submit copy of documentation indicating compliance.

1.3 QUALITY ASSURANCE

A. Manufacturer: Minimum of 5-years experience manufacturing similar products.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

1.5 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty against defects in manufacturing.

PART 2 - PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC PANELS

A. Manufacturer: Panolam FRP by Panolam Industries International, Inc., or equal.

B. Panels shall comply with the following:
   1. Classic Collection: White color.
   2. Surface Texture: Embossed.
   3. Thickness: 0.090 inches.

4. Barcol Hardness ASTM D2583: 35 typical.
5. Water Absorption: 0.2 percent typical.
6. Accessories: Color matched divides, outside corners, inside corners, end caps, and fastening rivets.
7. Adhesive: As recommended by manufacturer.

PART 3 -

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals.
   1. Clean substrate of dirt, dust, waxes, and other bond breaking substances prior to beginning installation.
   2. Install panels with bottom edge located to clear top of resilient base.
   3. Apply adhesive uniformly using adhesive manufacturers recommended trowel to the entire back of panels completely to the edge (100% coverage).
   4. Lay FRP panels in place leaving approximately 1/8” between panels and ¼” space top and bottom.
   5. Follow adhesive manufacturer’s recommendations for set and application times.
   6. Apply pressure to entire panel face with laminate type roller, removing trapped air and ensure proper adhesion between surfaces.

3.3 ADJUSTING AND CLEANING

A. Replace installations out of plumb and not aligned with adjacent panels and construction.

B. Clean panel face to remove soiling, stains, dust, and dirt using clean rags, and cleaning agents as instructed by manufacturer.

C. Leave installation clean, free of residue and debris resulting from work of this section.

END OF SECTION 06 64 00

SECTION 07 21 13 - EPS BUILDING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. EPS Building Insulation for underslab applications.

B. EPS Building Insulation for below grade applications.

1.2 RELATED SECTIONS

A. Section 03300 - Cast In Place Concrete: Perimeter and under-slab insulation installation.

B. Section 03300 - Cast In Place Concrete: Concrete base wall.

C. Section 06100 - Rough Carpentry.

1.3 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C 203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.

C. ASTM C 272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.

D. ASTM C 303 - Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.

E. ASTM C 518 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

F. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

G. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

H. ASTM D 2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

J. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

K. US Green Building Council.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
1. EA - Energy and Atmosphere: EA Credit 1: Optimize Energy Performance: Demonstrate percentage of performance improvement that meets or surpasses ASHRAE/IESNA Standard 90.1-2004.
2. Product Data for Credit MR 2.1 and 2.2: For products being recycled, documentation of total weight of project waste diverted from landfill.
3. Product Data for Credit MR Credit 3.1 and 3.2: Materials Reuse: 5 percent or 10 percent.
4. Product Data for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation including percentages by weight of post consumer and preconsumer recycled content
    a. Include statement indicating costs for each product having recycled content.
5. Product Data for Credit EQ 4.1: For adhesives used to laminate gypsum board panels to substrates, including printed statement of VOC content
6. Product Data for Credit MR 5.1 and Credit MR 5.2: Submit data, including location and distance from Project of material manufacturer and point of extraction, harvest or recovery for main raw material.
    a. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of 5 years documented experience in the manufacture of products specifed.

B. Installer Qualifications: Installer shall be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

D. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, foundation/structural system/substrate conditions, and insulation manufacturer's installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in conformance with the manufacturer's instruction. Store under cover in manufacturer's unopened packaging with identification labels or markings intact until ready for installation.

B. Products shall be fully supported in storage and prevented from contact with the ground until ready for installation.

C. Store in a protected area and protect against exposure to sun, rain, water, dirt, mud, and other residue that may affect performance. Cover stored products with breathable protective wraps.

1.7 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. Provide the manufacturer's written 20 year warranty that Insulfoam insulations, R-Tech and InsulFoam, have no thermal drift and the installed R-value will not degrade below the published values at the time of installation. Products with warranty's based on decreasing percentage or time weighted average thermal performance provisions will not be acceptable.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Insulfoam, a Carlisle Company, which is located at: 6004 N. Westgate Blvd. Suite 120 ; Tacoma, WA 98406; Toll Free Tel: 800-248-5995; Tel: 253-572-5111; Email: request info (info@insulfoam.com); Web:

YPERLINK "http://www.insulfoam.com" www.insulfoam.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 00 11 00.

2.2 EPS BUILDING INSULATION

A. Unfaced Flat Board Stock: InsulFoam rigid, closed cell, expanded polystyrene (EPS) boards, UL certified, complying with ASTM C 578:
   1. InsulFoam:
      a. Type I.
      b. Type VIII.
      c. Type II.
      d. Type IX.
      e. Type XIV.
      f. Type XV.
   2. Size:
      a. 4 foot by 4 foot.
      b. 4 foot by 8 foot.
      c. Custom sizes as indicated.
      d. Largest practical size for project.
   3. Thickness:
      a. Thickness required to achieve an R value as indicated on plans.
   4. Insect/Mold Resistant: Provide with insect and mold resistant treatments.
   5. Physical Properties Type I, Unfaced:
      a. Nominal Density (pcf): 1.0 as tested in accordance with ÅSTM C 303.
      b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ÅSTM C 518 or ÅSTM C 177.
         1) C .230 @ 25 degrees.
         2) C .240 @ 40 degrees.
         3) C .260 @ 75 degrees.
      c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
         1) R 4.35 @ 25 degrees.
         2) R 4.17 @ 40 degrees.
         3) R 3.85 @ 75 degrees.
      d. Compressive Strength, ÅSTM D 1621: Minimum 10 psi.
      e. Flexural Strength, ÅSTM C 203: Minimum 25 psi.
      f. Dimensional Stability, ASTM D 2126: Maximum 2 percent.
      g. Water Vapor Permeance, ASTM E 96: Maximum 5.0 perms.
      h. Water Absorption, ÅSTM C 272: Maximum 4.0 percent.
      i. Capillarity: None.
      j. Flame Spread as tested in accordance with ÅSTM E 84: Less than 20.
      k. Smoke Developed as tested in accordance with ASTM E 84: 150 to 300.
   6. Physical Properties Type VIII, Unfaced:
      a. Nominal Density (pcf): 1.25 as tested in accordance with ASTM C 303.

b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ASTM C 518 or ASTM C 177
   1) C .220 @ 25 degrees.
   2) C .235 @ 40 degrees.
   3) C .255 @ 75 degrees.
c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ÅSTM C 518 or ÅSTM C 177
   1) R 4.55 @ 25 degrees
   2) R 4.25 @ 40 degrees.
   3) R 3.92 @ 75 degrees.
d. Compressive Strength, ÅSTM D 1621: Minimum 13psi.
e. Flexural Strength, ASTM C 203: Minimum 30 psi.
f. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
g. Water Vapor Permeance, ÅSTM E 96: Maximum 3.5 perms.
h. Capillarity: None.
i. Flame Spread as tested in accordance with ASTM E 84: Less than 20.
j. Smoke Developed as tested in accordance with ÅSTM E 84: 150 to 300.

7. Physical Properties Type II, Unfaced:
   a. Nominal Density (pcf): 1.5 as tested in accordance with ÅSTM C 303.
   b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) C .210 @ 25 degrees.
      2) C .220 @ 40 degrees.
      3) C .240 @ 75 degrees.
   c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
      1) R 4.76 @ 25 degrees.
      2) R 4.55 @ 40 degrees.
      3) R 4.17 @ 75 degrees.
   d. Compressive Strength, ASTM D 1621: Minimum 15 psi.
   e. Flexural Strength, ASTM C 203: Minimum 35 psi.
   f. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   g. Water Vapor Permeance, ASTM E 96: Maximum 3.5 perms.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ASTM E 84: Less than 20.
   j. Smoke Developed as tested in accordance with ÅSTM E 84: 150 to 300.
8. Physical Properties Type IX, Unfaced:
   a. Nominal Density (pcf): 2.0 as tested in accordance with ÅSTM C 303.
   b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) R .200 @ 25 degrees.
      2) R .210 @ 40 degrees.
      3) R .230 @ 75 degrees.
   c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) C 5.00 @ 25 degrees.

2) C 4.76 @ 40 degrees.
3) C 4.35 @ 75 degrees.

d. Compressive Strength, ASTM D 1621: Minimum 25 psi.
e. Flexural Strength, ASTM C 203: Minimum 50 psi.
f. Dimensional Stability, ASTM D 2126: Maximum 2 percent.
g. Water Vapor Permeance, ASTM E 96: Maximum 2.0 perms.
h. Capillarity: None.
i. Flame Spread as tested in accordance with ASTM E 84: Less than 20.
j. Smoke Developed as tested in accordance with ASTM E 84: 150 to 300.

9. Physical Properties Type XIV, Unfaced:
   a. Nominal Density (pcf): 2.50 as tested in accordance with ASTM C 303.
   b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ÅSTM C 518 or ÅSTM C 177.
      1) C .198 @ 25 degrees.
      2) C .206 @ 40 degrees.
      3) C .222 @ 75 degrees.
   c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) R 5.05 @ 25 degrees.
      2) R 4.85 @ 40 degrees.
      3) R 4.50 @ 75 degrees.
   d. Compressive Strength, ASTM D 1621: Minimum 40 psi.
   e. Flexural Strength, ASTM C 203: Minimum 60 psi.
   f. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   g. Water Vapor Permeance, ÅSTM E 96: Maximum 2.5 perms.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ASTM E 84: Less than 20.
   j. Smoke Developed as tested in accordance with ÅSTM E 84: 150 to 300.
10. Physical Properties Type XV, Unfaced:
   a. Nominal Density (pcf): 3.0 as tested in accordance with ÅSTM C 303.
   b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) C .196 @ 25 degrees.
      2) C .198 @ 40 degrees.
      3) C .217 @ 75 degrees.
   c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ÅSTM C 518 or ÅSTM C 177.
      1) R 5.10 @ 25 degrees.
      2) R 5.05 @ 40 degrees.
      3) R 4.60 @ 75 degrees.
   d. Compressive Strength, ÅSTM D 1621: Minimum 60 psi.
   e. Flexural Strength, ÅSTM C 203: Minimum 75 psi.
   f. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   g. Water Vapor Permeance, ASTM E 96: Maximum 2.5 perms.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ÅSTM E 84: Less than 20.

j. Smoke Developed as tested in accordance with ASTM E 84: 150 to 300.

B. Faced Flat Board Stock: R-Tech faced one side with a printed polymeric facer and the other side with a metalized polymeric facer, rigid, closed cell, expanded polystyrene (EPS) boards, UL certified, complying with ÅSTM C 578:
1. R-Tech Board Stock:
   a. R-Tech I.
   b. R-Tech X.
   c. R-Tech IV.
   d. R-Tech VI.
   e. R-Tech VII.
2. Size:
   a. 4 foot by 4 foot.
   b. 4 foot by 8 foot.
   c. Custom sizes as indicated.
   d. Largest practical size for project.
3. Thickness:
   a. Minimum thickness to achieve R value as indicated on plans.
4. Insect/Mold Resistant: Provide with insect and mold resistant treatments.
5. Physical Properties: R-Tech I:
   a. Nominal Density (pcf): 1.00 as tested in accordance with ÅSTM C 303.
   b. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
      1) R 4.4 @ 25 degrees.
      2) R 4.2 @ 40 degrees.
      3) R 3.9 @ 75 degrees.
   c. Compressive Strength, ÅSTM D 1621: Minimum 13 psi.
   d. Flexural Strength, ÅSTM C 203: Minimum 33 psi.
   e. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   f. Water Vapor Permeance, ÅSTM E 96: Less than 1.0 perms.
   g. Water Absorption, ÅSTM C 272: Maximum 1.0 percent.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ÅSTM E 84: Less than 20.
   j. Smoke Developed as tested in accordance with ASTM E 84: 150 to 450.
6. Physical Properties: R-Tech X:
   a. Nominal Density (pcf): 1.35 as tested in accordance with ÅSTM C 303.
   b. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
      1) R 4.8 @ 25 degrees.
      2) R 4.6 @ 40 degrees.
      3) R 4.2 @ 75 degrees.
   c. Compressive Strength, ÅSTM D 1621: Minimum 15 psi.
   d. Flexural Strength, ASTM C 203: Minimum 40 psi.
   e. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   f. Water Vapor Permeance, ÅSTM E 96: Less than 5.0 perms.
   g. Water Absorption, ÅSTM C 272: Maximum 3.0 percent.

h. Capillarity: None.
i. Flame Spread as tested in accordance with ÅSTM E 84: Less than 75.
j. Smoke Developed as tested in accordance with ÅSTM E 84: Less than 450.

7. Physical Properties: R-Tech IV:
   a. Nominal Density (pcf): 1.80 as tested in accordance with ASTM C 303.
   b. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
      1) R 5.0 @ 25 degrees.
      2) R 4.8 @ 40 degrees.
      3) R 4.4 @ 75 degrees.
   c. Compressive Strength, ASTM D 1621: Minimum 25 psi.
   d. Flexural Strength, ÅSTM C 203: Minimum 50 psi.
   e. Dimensional Stability, ASTM D 2126: Maximum 2 percent.
   f. Water Vapor Permeance, ÅSTM E 96: Less than 1.1 perms.
   g. Water Absorption, ÅSTM C 272: Maximum 3.0 percent.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ASTM E 84: Less than 75.
   j. Smoke Developed as tested in accordance with ÅSTM E 84: Less than 450.
8. Physical Properties: R-Tech VI:
   a. Nominal Density (pcf): 2.4 as tested in accordance with ÅSTM C 303.
   b. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
      1) R 5.1 @ 25 degrees.
      2) R 4.9 @ 40 degrees.
      3) R 4.5 @ 75 degrees.
   c. Compressive Strength, ÅSTM D 1621: Minimum 40 psi.
   d. Flexural Strength, ASTM C 203: Minimum 60 psi.
   e. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   f. Water Vapor Permeance, ASTM E 96: Less than 1.1 perms.
   g. Water Absorption, ÅSTM C 272: Maximum 0.3 percent.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ÅSTM E 84: Less than 75.
   j. Smoke Developed as tested in accordance with ASTM E 84: 1 Less than 450.
9. Physical Properties: R-Tech VII:
   a. Nominal Density (pcf): 2.8 as tested in accordance with ÅSTM C 303.
   b. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177
      1) R 5.1 @ 25 degrees.
      2) R 5.0 @ 40 degrees.
      3) R 4.6 @ 75 degrees.
   c. Compressive Strength, ASTM D 1621: Minimum 60 psi.
   d. Flexural Strength, ÅSTM C 203: Minimum 75 psi.
   e. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   f. Water Vapor Permeance, ÅSTM E 96: Less than 1.1 perms.
   g. Water Absorption, ÅSTM C 272: Maximum 3.0 percent.

h. Capillarity: None.
i. Flame Spread as tested in accordance with ÅSTM E 84: Less than 75.
j. Smoke Developed as tested in accordance with ÅSTM E 84: 1 Less than 450.

C. Faced Fanfold Flat Board Stock: R-Tech Fanfold faced one side with a printed polymeric facer and the other side with a metalized polymeric facer, rigid, closed cell, expanded polystyrene (EPS) labor saving accordion style, UL certified, complying with ÅSTM C 578:
1. Size:
   a. Largest practical size for project.
2. Thickness:
   a. 3/8 inch.
   b. 1/2 inch.
   c. 3/4 inch.
   d. Thickness as indicated on the Drawings.
3. Insect Resistant: Provide with insect resistant treatment.
4. Physical Properties Type I:
   a. Nominal Density (pcf): 1.0 as tested in accordance with ÅSTM C 303.
   b. C-Value (Conductance) BTU/(hr/ft2/degrees F) per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) 3/8 inch C .240 @ 40 degrees.
      2) 1/2 inch C .260 @ 75 degrees.
      3) 3/4 inch C .260 @ 75 degrees.
   c. R-Value Thermal Resistance (hr/ft2/degrees F) /BTU per inch as tested in accordance with ASTM C 518 or ASTM C 177.
      1) 3/8 inch R 4.17 @ 40 degrees.
      2) 1/2 inch R 4.17 @ 40 degrees.
      3) 3/4 inch R 3.85 @ 75 degrees.
   d. Compressive Strength, ÅSTM D 1621: Minimum 10 psi.
   e. Flexural Strength, ÅSTM C 203: Minimum 33 psi.
   f. Dimensional Stability, ÅSTM D 2126: Maximum 2 percent.
   g. Water Vapor Permeance, ÅSTM E 96: Maximum 1.0 perms.
   h. Capillarity: None.
   i. Flame Spread as tested in accordance with ASTM E 84: Less than 20.
   j. Smoke Developed as tested in accordance with ASTM E 84: 150 to 300.

2.3 ACCESSORIES

A. Adhesive: Material and type compatible with EPS insulation board and acceptable to EPS insulation board manufacturer.

B. Wall Ties: Material and type compatible with EPS insulation board and acceptable to EPS insulation board manufacturer.

C. Mechanical Fasteners: Material and type compatible with EPS insulation board and acceptable to EPS insulation board manufacturer.

D. Furring Channels: Material and type compatible with EPS insulation board and acceptable to EPS insulation board manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION/APPLICATION

A. Install in accordance with manufacturer's instructions.

B. Install faced insulation with the facing on the side recommended by the manufacturer.

C. Insulation Board Joints: Stagger EPS insulation board joints in one direction for each course. Butt edges and ends tightly to adjacent EPS boards.

D. Interior Wall Sheathing Installation: On exterior side of stud framing, install EPS insulation board vertically or horizontally as required. Fasten vertically 12 inches (300 mm) maximum on centers using fasteners recommended by manufacturer. On interior side of stud framing, install a minimum of 1/2 inch (12.7 mm) thick gypsum wallboard over EPS board.

E. Interior Concrete and Masonry Walls: Install EPS insulation board directly to concrete and unit masonry substrates.
   1. Remove jagged surfaces or surface irregularities prior to installation.
   2. Attach insulation by using polystyrene compatible adhesive or an approved mechanical fastener.
   3. Butt edges tightly.
   4. Mechanically attach furring strips through the insulation and into the wall substrate with approved using fasteners recommended by manufacturer.
   5. On interior side of the wall, install a minimum of 1/2 inch (12.7 mm) thick gypsum wallboard over EPS board.

F. Cavity Walls: Install EPS insulation board on exterior surface of interior wythe of cavity wall, fitting board between wall ties and other projections and penetrations without large gaps or openings.
   1. Remove jagged surfaces or surface irregularities prior to installation.
   2. Attach insulation in conformance with the applicable code.

3. Maintain installed insulation to a point above the outer wythe as the work progresses to keep mortar from blocking the cavity.
4. Maintain a space between the insulation and the inside face of the outer wythe of at least 3/4 inch.
5. Stagger multiple layers of insulation. Butt edges tightly.
6. Tape all horizontal and vertical joints in the insulation with PolyGard 136 tape.

G. Protection Board and Perimeter Foundation Insulation: Install EPS insulation board on exterior surface of perimeter foundation walls.
1. Remove jagged surfaces or surface irregularities prior to installation.
2. Verify that damproofing or waterproofing is fully cured prior to application over such surfaces.
3. Attach insulation by pressing into cured damproofing or waterproofing or by using polystyrene compatible adhesive.
4. Butt edges tightly.
5. Apply polystyrene compatible sealant to the joint between the substrate and the insulation board to minimize water infiltration behind the insulation.
6. Do not allow ESP insulation to be exposed for an extended period of time to protect from UV exposure and damage from other trades.
7. Carefully backfill without displacing or damaging the insulation board.

H. Under Slab-On-Grade: Install EPS insulation board under slab-on-grade and over properly prepared subgrade of compacted fill and vapor retarder. Place EPS board with sides and ends butted.
1. Prepare subgrade by removing surface irregularities prior to installation.
2. Install vapor barrier over subgrade to protect against dampness and moisture penetration.
3. If under slab waterproofing is indicated on the Drawings verify that it is fully cured prior to application.
4. For vertical surfaces attach insulation by pressing into cured damproofing or waterproofing or by using polystyrene compatible adhesive.
5. Butt edges tightly.
6. For the top edge of vertical surfaces apply polystyrene compatible sealant to the joint between the substrate and the insulation board to minimize water infiltration behind the insulation.
7. Do not allow ESP insulation to be exposed for an extended period of time to protect from UV exposure and damage from other trades.
8. Carefully install reinforcing and concrete without displacing or damaging the insulation board.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 30 10 – WATERPROOF UNDERLAYMENT

PART 1 — GENERAL

1.1 SUMMARY

A. This Section specifies a self-adhering sheet membrane used as underlayment for sloped roofs.
   1. Severe climate application, Grace Ice & Water Shield®.

B. Related Sections: Refer to the following specification sections for coordination:
   1. Section 061000 - Rough Carpentry.
   2. Section 076113 – Standing Seam Sheet Metal Roofing.

C. Referenced Standards: Comply with the requirements of the following standards published by ASTM International to the extent referenced in this section.
   1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
   2. ASTM D461 - Standard Test Methods for Felt.
   3. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
   4. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   5. ASTM D3767 - Standard Practice for Rubber—Measurement of Dimensions.
   6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
   7. ASTM G90 – EMMAqua test.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

B. Manufacturer: Minimum 10 years experience producing roofing underlayment.

C. Installer: Minimum 2 years experience with installation of similar underlayment.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.

B. Cover materials and store in dry condition between temperatures of 40 and 90 degrees F (5 and 32 degrees C). Use within one year of date of manufacture. Do not store at elevated temperatures as that will reduce the shelf life of the product.

PART 2 — PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: GCP Applied Technologies, Inc, 62 Whittemore Avenue, Cambridge, MA 02140, Toll Free 866-333-3726, www.gcpat.com.

2.2 MATERIALS

A. Self-Adhering Sheet Membrane Roof Underlayment: Provide Grace Ice and Water Shield by GCP Applied Technologies, Inc. with the following characteristics:
   1. Material: Cold applied, self adhering membrane composed of a high strength polyethylene film coated on one side with a layer of rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the

polyethylene.
2. Color: Gray-black.
3. Membrane Thickness: 40 mil (1.02 mm) ASTM D3767 procedure A (Section 9.1).
4. Tensile Strength, Membrane: 250 psi (1720 kN/m2) ASTM D412 (Die C modified).
5. Elongation, Membrane: 250% ASTM D412 (Die C modified).
6. Low Temperature Flexibility: Unaffected @ -20°F (-29°C) ASTM D1970.
7. Adhesion to Plywood: 3.0 lbs/in. width (525 N/m) ASTM D903.
8. Permeance (Max): 0.05 Perms (2.9 ng/m2s Pa) ASTM E96.
9. Material Weight Installed (Max): 0.3 lb/ft2 (1.3 kg/m2) ASTM D461.
10. Primer: Water-based Perm-A-Barrier WB Primer by GCP Applied Technologies, Inc.
11. Code and Standards Compliance: Grace Ice and Water Shield meets the following:
    a. Underwriters Laboratories Inc. Class A fire classification under fiber-glass shingles and Class C under organic felt shingles (per ASTM E108/UL 790).
    b. Underwriters Laboratories Inc. Classified Sheathing Material Fire Resistance Classification with Roof Designs: P225, P227, P230, P237, P259, P508, P510, P512, P514, P701, P711, P717, P722, P723, P732, P734, P736, P742, P803, P814, P818, P824
    c. ICC ESR-1677 approval according to AC-48 Acceptance Criteria for Self-Adhered underlayments used as Ice Barriers.
    d. Miami-Dade County Code Report NOA 12-1115.02.
    e. Canadian Construction Materials Centre (CCMC) 13670-L
    f. City of Los Angeles RR 25330
    g. Florida State Approval Report No. FL289-R3

PART 3 — EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of roofing underlayment. Verify flashing has been installed. Starting work indicates installers acceptance of existing conditions.

3.2 INSTALLATION

A. Installation: Install roofing underlayment over entire roof, throughout all areas with standing seam sheet metal roofing. Strictly comply with manufacturer’s installation instructions including but not limited to the following:
    1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.
    2. Do not install underlayment on wet or frozen substrates.
    3. Install when surface temperature of substrate is a minimum of 40 degrees F (5 degrees C) and rising.
    4. Remove dust, dirt, loose materials and protrusions from deck surface.
    5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
    6. Prime concrete and masonry surfaces using specified primer at a rate of 500-600 square feet per gallon (12-15 sqm/L). Priming is not required for other suitable clean and dry surfaces.
    7. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first hori

zontal course.

8. Side laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
9. Patch penetrations and damage using manufacturer's recommended methods.

3.3 CLEANING AND PROTECTION

A. Protection: Protect from damage during construction operations and installation of roofing materials. Promptly repair any damaged or deteriorated surfaces.

B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired in the opinion of the Architect.

C. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protective film and reclean as necessary immediately before final acceptance.

END OF SECTION 07 30 10

SECTION 07 46 43 - COMPOSITION SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Engineered wood cladding.
2. Soffit panels.
3. Trim and fascia.
4. Sealant.
5. Weather barrier.
6. Flashing.

B. Related Sections include the following:

1. Division 06 Section "Exterior Finish Carpentry”

1.2 COORDINATION

A. Coordinate installation with flashings, weather barriers, and other adjoining construction to ensure proper sequencing for weathertight performance.

B. Coordinate with finish coat to be applied over primed cladding, soffits, and trim. Comply with coating manufacturer's written requirements for substrate primer.

1.3 PREINSTALLATION MEETINGS

1. Not Required.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Engineered wood cladding.
2. Soffit panels.
3. Trim and fascia.
4. Sealant.
5. Weather barrier.
6. Flashing.

B. Shop Drawings:

1. Included details of construction and installation.

C. Samples: For each exposed product and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by manufacturer certifying that engineered wood cladding complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for engineered wood cladding.

C. Research/Evaluation Reports: For each type of engineered wood cladding required, from ICC-ES.

D. Sample Warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed in packaging acceptable to cladding manufacturer for storage with labels clearly describing contents.

1. Furnish full lengths of engineered wood cladding, soffit and trim and fascia including related accessories, in a quantity equal to 2 percent of amount installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

B. Store products in manufacturer's labeled packaging until ready for installation. Protect from damage.

C. Store products off the ground, on a flat surface, and under a roof or separate waterproof covering.

1.10 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's limits.

1.11 WARRANTY

A. Manufacturer's Standard Warranty: Transferable limited warranty.

1. Warranty Period: Fifty years prorated from date of Substantial Completion.
2. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide LP Board and Batten or equal.

B. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 ACCESSORIES

A. Fasteners: ASTM A153, hot-dip galvanized or stainless steel nails with 0.113 inch diameter shank and 0.27 inch diameter head, long enough to achieve 1 1-1/2 inch penetration into structural sheathing and framing

B. Sealant: ASTM C920, minimum Class 25 sealant.

C. Weather Barrier: Fluid Applied Membrane Barriers See 07 27 26.

1. UV Exposure: Minimum three months.
2. Seam Tape: Weather barrier manufacturer's standard product.

D. Drainable Weather Barrier Building Wrap: ASTM E1677; made from polyolefin fibers.

1. Seam Tape: Weather barrier manufacturer's standard product.

E. Flashing: Aluminum at window and door heads and where indicated on Drawings. Refer to Division 07 Section for sheet metal flashing.

1. Aluminum Flashing Finish: Factory-prime coating

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify location of concealed framing for support and anchorage of engineered wood cladding, soffit, and trim and fascia.

B. Verify that substrate has been installed to permit proper installation of engineered wood cladding soffit and trim and fascia.

3.2 PREPARATION

A. Prepare substrates using methods recommended in writing by the cladding manufacturer.

B. Do not proceed with installation until substrates have been properly prepared and deviations from manufacturer's recommended tolerances are corrected.

C. Commencement of installation constitutes acceptance of conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

1. Install in accordance with conditions stated in ICC-ES ESR-1301.
2. Properly space joints to allow for equilibration.

B. Do not install to green wood or crooked structural framing. Do not install over rain soaked or buckled materials. Do not install if excessive moisture is present in the interior, including that from curing concrete and plaster.

C. Do not cut cladding to fabricate trim; use trim components.

D. After installation, seal and flash joints except the overlapping horizontal lap joints. Seal around penetrations. Paint exposed cut edges.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products.

END OF SECTION

SECTION 07 61 13 – STANDING SEAM SHEET METAL ROOFING

PART 1 - GENERAL

A. Section includes

1. Manufactured standing seam metal panel roofing system.
2. Related trim and flashing, including copings, gutters, and downspouts.

B. Related Sections

1. Section 07 30 10: Waterproof underlayment (“ice and water membrane”).
2. Section 07 62 00: Fabrication and installation requirements for gutters and downspouts.

C. PERFORMANCE REQUIREMENTS

1. Notwithstanding other requirements, provide only proprietary system, components, and installation approved by or acceptable to Factory Mutual for indicated applications.
2. Wind-Uplift Resistance: Provide metal roof panel assemblies that conform to UL 580 for wind-uplift resistance class indicated.
    a. Fire/Windstorm Classification: Class 1A-90.
    b. Verification: Listed by UL or other testing agency acceptable to authorities having jurisdiction.
3. Water Penetration: No water penetration when tested per ASTM E331 for indicated roof slopes.
4. Thermal Movements: Provide metal roof panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.
    a. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

D. DESIGN REQUIREMENTS

1. 12”+/- rib spacing, 1” tall rib, stock color to be approved by owner.

E. ACTION SUBMITTALS

1. Product Data: System components and finishes.
2. Shop Drawings: Include small-scale layouts of panels on walls and roofs, and large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, penetrations, closures, gutters, downspouts, and special details.
3. Verification Samples:
    a. Roofing: Required color prepared on minimum 4- by 4-inch metal sheets.

F. SUBMITTALS – CLOSEOUT

1. Manufacturer warranties.

G. QUALITY ASSURANCE

1. Installer Qualifications: Experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project that have a record of successful in-service performance.

2. Reference Standard: Perform Work in accordance with applicable requirements of SMACNA "Architectural Sheet Metal Manual."

H. DELIVERY, STORAGE, AND HANDLING

1. Comply with requirements of Section 00 11 00.

2. Protect products against damage, including staining, contact with incompatible substances, and uneven weathering.

3. Handle metal products to prevent scratching or other damage to surfaces, and mechanical damage such as dents and kinks. Do not allow metal components to slide or scrape against each other.

4. Provide protective pads for contact points of ladders and tools to prevent direct contact with installed metal.

5. Store products with one end elevated for positive drainage.

I. WARRANTY

1. Warranties are subject to requirements of Section 00 11 00 and the Conditions of the Contract. Manufacturer warranties are supplementary to Contractor’s general warranty.

2. Manufacturer Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
    a. Warranty Period: 10 years from date of Substantial Completion.

3. Manufacturer Warranty for Panel Finish: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
    a. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
        i. Color fading more than 5 Hunter units when tested according to ASTM D2244.
        ii. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
        iii. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
4. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

A. MANUFACTURERS

1. Subject to compliance with requirements, products of the following manufacturers will be acceptable:
    a. Atas International, inc.
    b. Petersen Aluminum Corporation.
    c. Or equal.

B. MATERIALS

1. Color-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and painted by coil-coating process to comply with ASTM A755.
    a. Galvanized Steel Sheet: ASTM A653, G90; structural quality.
2. Exterior Coating: 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with total minimum dry film thickness of 0.9 mil.
    a. Exterior Color: Stock color to be approved by owner, Atas Charcoal basis of design.
3. Fasteners: Screws with corrosion-resistant finish recommended by roofing system manufacturer for Project applications.
    a. Cadmium-plated screws are not acceptable.
4. Field Sealant: Silicone sealant conforming to Section 07920.
5. Underlayment: Use self-adhesive ice & water shield membrane.

C. ROOFING SYSTEM COMPONENTS

1. Standing Seam Roofing: Manufactured architectural roofing system consisting of roofing panels and seams machine formed from steel sheet, with concealed anchorage that permits unrestrained thermal movement.
    a. Roofing Panels: Flat surface between seams (no ribs).
    b. Seam Covers: Snap-on type with factory-applied internal resilient seal.
    c. Seam Height: 1”.
    d. Seam Spacing: 12”.
    e. Metal Thickness: 24 gage.
2. Accessory Components: Provide all components needed for complete roof panel system, including trim, ridge vents, penetration boots and flashing, anchorage, expansion control, and transition units.
    a. Exposed Accessories: Match material and finish of roofing panels.
    b. Concealed Accessories: Corrosion-resistant metal compatible with roofing panels.

D. Accessory Components: Provide all

E. FABRICATION

1. Fabricate sheet metal closures and other trim from same base metal and same thickness as roofing panels.
2. Form sections true to shape, accurate in size, square, and free from distortion or other defects.
3. Fabricate metal only by machine. Hand forming of sheet metal is not allowed unless specifically approved by Architect.
4. Form roofing panels in continuous, single pieces from eave to ridge.
5. Fabricate cleats and starter strips of same material as sheet, minimum 1-1/2 inches wide, interlockable with item to be fastened.
6. Hem exposed edges of metal on underside minimum 3/8 inch; at vertical faces provide 15 degree break for drip.
7. Fabricate flashing to allow toe to extend minimum 2 inches over protected construction. Return and brake edges.
8. Copings: Fabricate copings per SMACNA "Architectural Sheet Metal Manual" for concealed fastener installation.
    a. Comply with applicable fabrication requirements of Section 07620.
    b. Material: Fabricate from color-coated steel sheet used for roofing panels.
    c. Fabricate in 8- or 10-ft long sections.
    d. Fabricate joint plates of same thickness as copings.
    e. Provide continuous cleats to support edge of external leg.
    f. Where copings are to protect upper edge of standing seam metal roof, form to fit closely to roof profile.
    g. Provide shop-fabricated units for changes in plane and other transitions. Miter corners and seal watertight.
    h. Joint Style: Butt, with 12-inch wide concealed backup plate.
9. Gutters: Fabricate hanging gutters suitable for Project applications per SMACNA "Architectural Sheet Metal Manual."
    a. Comply with applicable fabrication requirements of Section 07620.
    b. Material: Fabricate from color-coated steel sheet used for roofing panels.
        i. Interior of gutter to be finished the same as exterior.
        ii. Fabricate in minimum 8-ft long sections.
        iii. Provide gutter supports spaced 36 inches o/c, fabricated from same metal as gutters.
        iv. Provide stainless steel wire strainers at outlets.
        v. Provide end caps.
10. Downspouts: Fabricate rectangular downspouts with watertight vertical seams per SMACNA "Architectural Sheet Metal Manual."

a. Comply with applicable fabrication requirements of Section 07620.
b. Material: Fabricate from color-coated steel sheet used for roofing panels.
c. Provide mitered elbows and offsets.
d. Provide metal hanger straps fabricated from same metal as downspouts that are designed to hold downspouts 1 inch away from wall surface.
e. Coordinate downspout locations with Architect.

PART 3 – EXECUTION

A. PREPARATION

a. Remove substrate projections that would penetrate underlayment or telegraph through completed membrane.

B. INSTALLATION – UNDERLAYMENT

a. Waterproof underlayment for roof edges and valleys is specified in Section 07132.

b. Apply one layer of underlayment over entire surface to receive standing seam roofing.

i. Apply horizontally eave to ridge in shingle fashion.

ii. Apply with 6" overlaps and 18" end laps.

c. Cover voids in substrate with sheet metal to provide continuous support for membrane. Minor voids in wood substrates may be filled flush with latex filler.

C. INSTALLATION – ROOFING PANELS AND TRIM

a. Lay out roofing panels with accurately aligned seams and without end panels that are less than half normal width.

b. Install panels with seams in accurate, plumb lines.

c. Install starter and edge trim before installing roof panels.

d. Provide permanent separation between dissimilar metals.

e. Anchor panels and other components of the work securely in place, with provisions for thermal and building movements.

f. Fasten roof panels to supports with concealed clips.

g. Install seam covers and panel terminations to be weatherproof.Provide accessory components required for complete weathertight roofing assembly, including trim, flashings, transition pieces, closure strips, and similar items.

h. Flashing and Trim:

i. Use concealed fasteners where possible.

ii. Install work with laps, joints, and seals that will be permanently watertight and weatherproof.

iii. Install counterflashings with minimum 3 inch end laps.

i. Copings: Install with concealed fasteners and concealed sealants to provide watertight, weatherproof protection for construction below. Install copings per Factory Mutual requirements for wind uplift resistance.

j. Hanging Gutters: Join sections with lapped joints sealed watertight with elastomeric sealant. Provide for thermal expansion. Attach gutters per SMACNA "Architectural Sheet Metal Manual" to firmly anchored gutter straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts. Install wire strainer in outlet tubes.

k. Downspouts: Join sections with 1-1/2-inch telescoping joints. Attach downspouts to building with straps at top, bottom, and not more than 5 ft o/c in between.

i. Provide connection boots for downspouts that are connected to underground piping.

ii. Provide precast concrete splash blocks for downspouts indicated to discharge at grade.

D. CLEANING

a. Remove substances that would cause staining, corrosion, or premature weathering of exposed surfaces.

E. ADJUSTING

a. Provide new conforming work to replace damaged or deteriorated panels which cannot be acceptably repaired in the field.

F. PROTECTION

a. Do not allow traffic on completed roof.

END OF SECTION 07 61 13

Section 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items.

B. Flashing and counter-flashing.

1.2 SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.

C. Shop Drawings: Indicate material profile, jointing locations, jointing details, fastening methods, flashings, terminations, and installation details.
1. Included details interacting with air and water resistive barriers and joint sealants.
2. Provide documentation that exterior metal trim, meets ANSI/SPRI ES-1 and all applicable FM 1-49 standards for design, fabrication and installation.

D. Samples:
1. Finish Sample: Submit two samples illustrating each metal finish color.
2. Fabrication Sample: Submit sample of coping lap joint as it will occur every 10 feet.

E. Certificate: Certify that products meet or exceed specified requirements

F. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention

G. Maintenance Data: For users operation and maintenance of system including:
1. Methods for maintaining system's materials and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years experience.
1. Certified member in good standing in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details.

B. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years experience on projects of similar size and complexity.

1.4 DELIVERY, STORAGE, AND HANDLING

A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.5 WARRANTY

A. Manufacturer's Finish Warranty: Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2. PRODUCTS

2.1 DESCRIPTION

A. Sheet metal including steel, stainless steel, and aluminum fabricated into items such as flashings, counterflashings, gutters, downspouts, and other items indicated and scheduled.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. ANSI/SPRI ES-1 and all applicable FM 1-49 standards for design, fabrication and installation.

B. Design Sheet metal flashing and trim assemblies to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim that does not rattle, leak, or loosen, and will remain watertight.

2.3 MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating or AZ50 coating; minimum 0.02 inch (0.6 mm) thick base metal, shop pre-coated with PVDF coating.
   1. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: Coordinate color selections with contractor and owner.

B. Stainless Steel: for masonry use: ASTM A 666 Type 304, soft temper, 0.018 inch thick; smooth mill finish.

C. Stainless Steel: for all other uses: ASTM A 666 Type 304, rollable temper, 0.018 inch (0.46 mm) thick; smooth No. 4 finish.

2.4 FABRICATION

A. Fabricate metal flashings and sheet metal work other than aluminum in accordance with applicable SMACNA Architectural Sheet Metal Manual.
   1. Provide end dams, back dam legs, and end caps on all horizontal flashing elements.

B. Fabricate cleats of same material as sheet, minimum 4 inch, interlocking with cleat. Provide cleat one gage heavier than sheet metal component being anchored. Continuous cleat at outside face of coping.

C. Form pieces in 10 foot maximum lengths. Make allowance for expansion at joints. Use maximum length sections possible to minimize joints.

D. Hem exposed edges on underside ½ inch. Miter and seal corners with sealant.

E. Apply isolation coating to metal surfaces to be embedded in concrete or mortar (not required for stainless steel flashing)

F. Form joints between lengths of flashing sections with laps and embed two beads of elastomeric sealant at each side of joint.
   1. Use prefabricated corner metal flashing with soldered joints at change in direction (corners). Prefabricated corner metal flashing to extend 12 inches at each side of wall. At moving joints, use sealed interlocking hooked seams.
   2. Fabricate corners from one piece with minimum 18 inch long legs; seamed for rigidity, seal and sealant.

G. All exposed or visible metal flashing and trim to be finished in selected color as indicated including exposed rear faces of end dams, joints, etc. No exposed or visible steel or aluminum flashing work to be unfinished

H. Fabricate custom flashing details and saddles to minimize solder joints

I. Install sealant at flashing joints and laps

J. Metal Flashings including window / door head and sill flashing, through wall flashing, drip edge flashing, base flashing, etc.

   1. Form all flashing surfaces as shown on drawings.

   2. From flashing to provide 1:4 slope to the exterior unless otherwise noted in the drawings.

K. Reglets and Coping Flashings
   1. Prefinished sheet metal as detailed and in accordance with SMACNA Architectural Sheet Metal Manual details. Provide slotted fixing holes and hot dipped galvanized steel/plastic washer fasteners.

L. Fabricate vertical faces with bottom edge formed outward ¼ inch and hemmed to form drip.

M. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

N. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

O. Exposed Edges:
   1. Clip or fold exposed ends of flashing to form rounded edges.
   2. File exposed metal edges, ends, corners, folds or laps to remove sharp edges and ensure rounded edges.
   3. Apply sealant coverage to match metal finishes over clipped and filed metal edges, ends, corners, folds or laps.
   4. Adjust metal hems, seams, edges and other aspects to minimize projections.

P. Form sections square, true and accurate to size, free from distortion and other defects

detrimental to appearance or performance.

1. Align of lengths of sheet metal.
2. Clip hems and edges.
3. Accurate and consistent leg length, hems and face profiles.
4. Concealed fastening whenever possible
5. Color matched sealant and paints, rivets and any exposed fasteners

2.5 ACCESSORIES

A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

B. Flexible Flashing:
   1. For use under metal copings and flashings Section 07 25 00 - Weather Barriers; use high temperature type

C. Slip Sheet: Rosin sized building paper.

D. Protective Backing Paint: See Section 09 90 00 – Painting and Coating.

E. Sealant: As specified in Section 07 90 05 Joint Sealers

F. Fasteners:
   1. Wood: Steel pan head screws with coarse thread.
      a. #8 x 1 inch (minimum) long stainless steel suitable for metal flashing application. Series 300 or 400 stainless.
      b. For exposed conditions use hex-head stainless steel screws Series 300, with neoprene washer; hex heads color to match flashing.

   2. Masonry, concrete, stone:
      a. One piece steel screw set into predrilled hole in concrete or masonry for medium duty connections.
         1) 1/4 inch diameter x 1-1/2 inch long stainless fastener. Hex head for easier installation, Philips head for softer materials such as concrete block. Provide stainless steel washers to hold metal securely. Minimum 5/8 inch diameter.
         2) For exposed conditions, provide stainless steel washer with bonded neoprene gasket.
      b. Steel pan head screws with stainless steel washers set into plastic plugs predrilled into concrete or masonry for lighter duty connections. Plastic plug version is required in softer materials such as brick or stucco.
         1) #8 x 1 inch long stainless steel pan head screws with 5/8 inch diameter stainless steel washers. For exposed conditions, provide washers with bonded neoprene gaskets. Stainless to be 300 Series when exposed otherwise 300 or 400 Series is acceptable.
         2) Plastic plugs to be 1-1/8 inch long.

   3. Sheet Steel:
      a. Steel pan head screws with fine thread for metal. Can be self tapping or self drilling.

1) #8 x ½ inch (minimum) long stainless steel suitable for metal flashing application. Stainless to be 300 Series when exposed otherwise 300 or 400 Series is acceptable.
2) For exposed conditions use pan head stainless steel screws, with neoprene washer, heads colored to match flashing.

PART 3. EXECUTION

3.1 EXAMINATION

A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.2 PREPARATION

A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install work of this section in accordance with: Construction documents, reviewed shop drawings, manufactures installation instruction, SMACNA Architectural Sheet Metal Manual and Aluminum Sheet Metal Work on Building Construction.

B. Use concealed fasteners except where approved before installation.

C. Provide underlay sheet metal as required. Secure in place and lap underlayment joints 4 inch minimum.

D. Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock and standing seams forming tight fit over hook strips.

E. Lock end joints and seal with sealant.

F. Fit flashings tight in place. Provide for thermal expansion. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

G. Solder metal joints for full metal surface contact. After soldering, wash metal clean and neutralizing solution and rinse with water. Paint soldered assemblies in shop.

H. Install surface mounted reglets true and level, and caulk top of reglet with sealant.

I. Install head and sill flashings at windows and doors in one continuous piece wherever possible.

J. Install flashings lapped “shingle” style with membranes to divert water to the exterior.

K. Install all flashings so that all surfaces have a minimum slope of 1:4 to the exterior.

L. Cross Cavity Wall Flashings
1. Fit flashings together so that one end of each section is free to move in the joint.
2. Provide folded end dams when flashings terminate. Caulk end dam to flashing and adjacent material to make watertight.
3. Provide crickets where required to divert moisture to the exterior face of cladding assemblies.

3.4 PROTECTION

A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.5 SCHEDULE

A. Unless otherwise noted all exposed exterior sheet metal flashing and trim is Pre-Finished Aluminum.

B. Counter Flashing:
1. Material: Stainless Steel.
2. Thickness: 24 gauge/0.024 inches.
3. Color: To match adjacent metal panel or coping.
4. Seaming: Fully-welded shop fabricated corners and end dams.

C. Masonry Through Wall flashing:
1. Material: Prefinished Aluminum.
2. Thickness: 12 gauge/0.080 inches.
3. Color: To be selected by Owner from manufacture's standard colors.
4. Seaming: Fully-welded shop fabricated corners and end dams.

D. Gutters:
1. Material: Prefinished Aluminum.
2. Thickness: 18 gauge/0.040 inches
3. Color: To be selected by Owner from manufacture's standard colors.
4. Seaming: Fully-welded shop fabricated corners, ends and intersections.

E. Downspouts:
1. Material: Prefinished Aluminum.
2. Thickness: 18 gauge/0.040 inches
3. Color: To be selected by Owner from manufacture's standard colors.
4. To match existing

F. Window Head Flashing:
1. Material: Prefinished Aluminum.
2. Thickness: 20 gauge/0.032 inches.
3. Color: To be selected by Owner from manufacture's standard colors.
4. Seaming: Fully-welded shop fabricated corners and end dams.

G. Coping, Cap, Parapet, Sill and Ledge flashings:
1. Material: Prefinished Aluminum.
2. Thickness: 12 gauge/0.080 inches
3. Color: To be selected by Owner from manufacture's standard colors.
4. Seaming: Butt joint with concealed splice plates.
5. Corners: Fully-welded shop fabricated corners, ends and intersections.

H. Pre-finished Metal Sill Flashing:
1. Material: Prefinished Aluminum.

2. Thickness: 12 gauge/0.080 inches
3. Color: To be selected by Owner from manufacture's standard colors.
4. Seaming: Butt joint with concealed splice plates.
5. Corners: Fully-welded shop fabricated corners, ends and intersections.

I. Pre-finished Aluminum Accents:
1. Material: Prefinished Aluminum.
2. Thickness: 12 gauge/0.080 inches
3. Color: To be selected by Owner from manufacture's standard colors.
4. Seaming: Butt joint with concealed splice plates.
5. Corners: Fully-welded shop fabricated corners, ends and intersections

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

a. Joints between different materials.
b. Perimeter joints between frames of doors, windows and louvers.
c. Control and expansion joints in ceilings and other overhead surfaces.
d. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

a. Isolation and contraction joints in cast-in-place concrete slabs.
b. Joints between different materials listed above.
c. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors windows.
f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
g. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

a. Control and expansion joints in tile flooring.
b. Other joints as indicated.

B. Related Sections include the following:

1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 08 Section "Glazing" for glazing sealants.

3. Division 09 Section "Gypsum Board" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
4. Division 09 Section "Tiling" for sealing tile joints.
5. Division 09 Section "Acoustical Panel Ceilings" and for sealing edge moldings at perimeters of acoustical ceilings.
6. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.

F. Qualification Data: For Installer.

G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. Field Test Report Log: For each elastomeric sealant application.

J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

K. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each type of elastomeric sealant and joint substrate indicated.
    b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

E. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Multicomponent Nonsag Polysulfide Sealant [**ES-**<#>]:

1. Products:

a. Pacific Polymers, Inc.; Elasto-Seal 227 Type II (Gun Grade).
b. Pecora Corporation; Synthacalk GC-2+.

c. Polymeric Systems Inc.; PSI-350.
d. PolySpec Corp.; T-2235-M.
e. PolySpec Corp.; T-2282.
f. PolySpec Corp.; Thiokol 2P.
g. Sonneborn, Division of ChemRex Inc.; Sonolastic Polysulfide Sealant.
h. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile and wood.

F. Multicomponent Nonsag Immersible Polysulfide Sealant:

1. Products:

a. Pecora Corporation; GC-2+.
b. PolySpec Corp.; T-2235-M.
c. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic), NT (nontraffic), and I (immersible), Class [**1**] [**2**].
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Coated glass, galvanized steel and brick.

G. Multicomponent Pourable Polysulfide Sealant:

1. Products:

a. Meadows, W. R., Inc.; Deck-O-Seal.
b. Pacific Polymers, Inc.; Elastoseal 227 Type I (Pourable).
c. Approved Product.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A**,** and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Brick, granite, limestone, marble, ceramic tile and wood**.**

H. Single-Component Nonsag Polysulfide Sealant:

1. Products:

    a. Pacific Polymers, Inc.; Elastoseal 230 Type I (Gun Grade).
    b. Polymeric Systems Inc.; PSI-7000.
    c. Approved Product.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile and wood.

I. Multicomponent Nonsag Neutral-Curing Silicone Sealant:

1. Products:

    a. Dow Corning Corporation; 756 H.P.
    b. Approved Product.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, limestone, marble, granite and ceramic tile.

J. Single-Component Neutral- and Basic-Curing Silicone Sealant:

1. Products:

    a. Dow Corning Corporation; 790.
    b. GE Silicones; SilPruf LM SCS2700.
    c. Tremco; Spectrem 1 (Basic).
    d. GE Silicones; SilPruf SCS2000.
    e. Pecora Corporation; 864.
    f. Pecora Corporation; 890.
    g. Polymeric Systems Inc.; PSI-641.
    h. Sonneborn, Division of ChemRex Inc.; Omniseal.
    i. Tremco; Spectrem 3.
    j. Dow Corning Corporation; 791.
    k. Dow Corning Corporation; 795
    l. GE Silicones; SilPruf NB SCS9000.
    m. GE Silicones; UltraPruf II SCS2900.
    n. Pecora Corporation; 865.

o. Pecora Corporation; 895.
p. Pecora Corporation; 898.
q. Approved Product.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile and wood.

6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

K. Single-Component Neutral-Curing Silicone Sealant:

1. Products:

a. Dow Corning Corporation; 799.
b. GE Silicones; UltraGlaze SSG4000.
c. GE Silicones; UltraGlaze SSG4000AC.
d. Polymeric Systems Inc.; PSI-631.
e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
f. Tremco; Proglaze SG.
g. Tremco; Spectrem 2.
h. Tremco; Tremsil 600.
i. Approved Product.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M**,** G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and ceramic tile.

L. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:

1. Products:

a. Pecora Corporation; 898.
b. Tremco; Tremsil 600 White.
c. Approved Product.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

5. Uses Related to Joint Substrates: M**,** G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and ceramic tile.

M. Multicomponent Nonsag Urethane Sealant:

1. Products:

    a. Pecora Corporation; Dynatrol II.
    b. Tremco; Dymeric 511.
    c. Tremco; Vulkem 922.
    d. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 50.
4. Uses Related to Exposure: NT (nontraffic) and T (traffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile and wood.

N. Multicomponent Nonsag Urethane Sealant:

1. Products:

    a. Schnee-Morehead, Inc.; Permathane SM 7200.
    b. Sika Corporation, Inc.; Sikaflex - 2c NS TG.
    c. Sonneborn, Division of ChemRex Inc.; NP 2.
    d. Tremco; Vulkem 227.
    e. Tremco; Vulkem 322 DS.
    f. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile and wood.

O. Multicomponent Nonsag Urethane Sealant:

1. Products:

    a. Bostik Findley; Chem-Calk 500.

b. Pacific Polymers, Inc.; Elasto-Thane 227 R Type II (Gun Grade).
c. Polymeric Systems Inc.; PSI-270.
d. Tremco; Dymeric.
e. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Additional Movement Capability: 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
5. Use Related to Exposure: NT (nontraffic).
6. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Galvanized steel, brick, granite, marble, ceramic tile and wood.

P. Multicomponent Nonsag Urethane Sealant:

1. Products:

a. Pacific Polymers, Inc.; Elasto-Thane 227 High Shore Type II (Gun Grade).
b. Pacific Polymers, Inc.; Elasto-Thane 227 Type II (Gun Grade).
c. Pecora Corporation; Dynatred.
d. Polymeric Systems Inc.; PSI-270.
e. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Galvanized steel, brick, granite, marble and ceramic tile.

Q. Multicomponent Nonsag Immersible Urethane Sealant:

1. Products:

a. Pacific Polymers, Inc.; Elasto-Thane 227 R Type II (Gun Grade).
b. Pecora Corporation; Dynatred.
c. Tremco; Vulkem 227.
d. Tremco; Vulkem 322 DS.
e. Approved Product.

2. Type and Grade: M (multicomponent) and NS (nonsag).
3. Class: 25.
4. Use[**s**] Related to Exposure: T (traffic) NT (nontraffic)] and I (immersible), Class 1.
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

R. Multicomponent Pourable Urethane Sealant:

1. Products:

a. Bostik Findley; Chem-Calk 550.
b. Meadows, W. R., Inc.; POURTHANE.
c. Pacific Polymers, Inc.; Elasto-Thane 227 High Shore Type I (Self Leveling).
d. Pacific Polymers, Inc.; Elasto-Thane 227 Type I (Self Leveling).
e. Pecora Corporation; Urexpan NR-200.
f. Polymeric Systems Inc.; PSI-270SL.
g. Schnee-Morehead, Inc.; Permathane SM 7201.
h. Tremco; THC-901.
i. Tremco; THC-900.
j. Tremco; Vulkem 245.
k. Pecora Corporation; Urexpan NR 300, Type H.
l. Pecora Corporation; Urexpan NR 300, Type M.
m. Approved Product.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

S. Multicomponent Pourable Urethane Sealant:

1. Products:

a. Pecora Corporation; Dynatrol II-SG.
b. Sika Corporation, Inc.; Sikaflex - 2c SL.
c. Sonneborn, Division of ChemRex Inc.; SL 2.
d. Approved Product.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 50.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

T. Multicomponent Pourable Immersible Urethane Sealant:

1. Products:

   a. Pacific Polymers, Inc.; Elasto-Thane 227 R Type II (Self Leveling).
   b. Tremco; Vulkem 245.
   c. Approved Product.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) NT (nontraffic) and I (immersible), Class 1.
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

   a. Use O Joint Substrates: Brick and wood.

U. Single-Component Nonsag Urethane Sealant:

1. Products:

   a. Sika Corporation, Inc.; Sikaflex - 1a.
   b. Sonneborn, Division of ChemRex Inc.; Ultra.
   c. Sonneborn, Division of ChemRex Inc.; NP 1.
   d. Tremco; Vulkem 116.
   e. Approved Product.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

   a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

V. Single-Component Nonsag Urethane Sealant:

1. Products:

   a. Bostik Findley; Chem-Calk 900.
   b. Bostik Findley; Chem-Calk 915.
   c. Bostik Findley; Chem-Calk 916 Textured.
   d. Bostik Findley; Chem-Calk 2639.
   e. Pecora Corporation; Dynatrol I-XL.
   f. Polymeric Systems Inc.; Flexiprene 1000.
   g. Polymeric Systems Inc.; PSI-901.
   h. Schnee-Morehead, Inc.; Permathane SM7100.
   i. Schnee-Morehead, Inc.; Permathane SM7108.
   j. Schnee-Morehead, Inc.; Permathane SM7110.
   k. Sika Corporation, Inc.; Sikaflex - 15LM.

l. Tremco; DyMonic.
m. Tremco; Vulkem 921.
n. Tremco; Vulkem 931.
o. Approved Product.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 100/50.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

W. Multicomponent Nonsag Immersible Urethane Sealant:

1. Products:

a. Tremco; Vulkem 116.
b. Tremco; Vulkem 921.
c. Approved Product.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 50.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic) and I (immersible), Class 1.
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

X. Single-Component Pourable Urethane Sealant:

1. Products:

a. Sika Corporation, Inc.; Sikaflex - 1CSL.
b. Sonneborn, Division of ChemRex Inc.; SL 1.
c. Tremco; Vulkem Nova 300 SSL.
d. Approved Product.

2. Type and Grade: S (single component) and P (pourable).
3. Class: 50.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Galvanized steel, brick, granite, marble, ceramic tile and wood.

Y. Single-Component Pourable Urethane Sealant:

1. Products:

a. Bostik Findley; Chem-Calk 950.
b. Pecora Corporation; Urexpan NR-201.
c. Polymeric Systems Inc.; Flexiprene 952.
d. Schnee-Morehead, Inc.; Permathane SM7101.
e. Tremco; Tremflex S/L.
f. Tremco; Vulkem 45.
g. Approved Product.

2. Type and Grade: S (single component) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: T (traffic).
5. Uses Related to Joint Substrates: M, G**,** A, and, as applicable to joint substrates indicated, O.

a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, marble, ceramic tile and wood.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.

B. Products:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Schnee-Morehead, Inc.; SM 8200.
4. Sonneborn, Division of ChemRex Inc.; Sonolac.
5. Tremco; Tremflex 834.
6. Approved Product.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Products:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
c. Approved Product.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products:

a. Pecora Corporation; BA-98.
b. Tremco; Tremco Acoustical Sealant.
c. Approved Product.

2.6 PREFORMED JOINT SEALANTS

A. Preformed Silicone-Sealant System: Manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Products:

a. Dow Corning Corporation; 123 Silicone Seal.
b. GE Silicones; UltraSpan US1100.
c. Pecora Corporation; Sil-Span.
d. Tremco; Spectrem Ez Seal.
e. Approved Product.

B. Preformed Foam Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in precompressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer; and complies with the following:

1. Products:

a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
b. illbruck Sealant Systems, Inc.; Wilseal 600.
c. Polytite Manufacturing Corporation; Polytite B.
d. Polytite Manufacturing Corporation; Polytite Standard.
e. Sandell Manufacturing Co., Inc.; Polyseal.
f. Approved Product.

2. Properties: Permanently elastic, mildew resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.

a. Density: Manufacturer's standard.

2.7 PREFORMED TAPE SEALANTS

A. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Tape Sealant: Closed-cell, PVC foam tape sealant; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for applications in which tape acts as the primary sealant.
2. Type 2, for applications in which tape is used in combination with a full bead of liquid sealant.

2.8 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. EIFS

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.

I. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

J. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
2. Inspect tested joints and report on the following:

a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
b. Whether sealants filled joint cavities and are free of voids.
c. Whether sealant dimensions and configurations comply with specified requirements.

3. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
4. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove

sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOOR FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal doors frames.

B. Related Sections:

1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
2. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
3. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. For the following items, prepared on Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:

a. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

b. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Firedoor Corporation.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Karpen Steel Custom Doors & Frames.
10. Kewanee Corporation (The).
11. Mesker Door Inc.
12. Pioneer Industries, Inc.
13. Security Metal Products Corp.
14. Steelcraft; an Ingersoll-Rand company.
15. Windsor Republic Doors.
16. Approved Manufacturer.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush and Glazed Panels As indicated.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than R-8 when tested according to ASTM C 1363.

        1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Beveled edge.

    a. Beveled Edge: 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
5. Top and Bottom Edges: Closed with flush 0.042-inch-thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

a. Width: 1-3/4 inches.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level C (Standard Duty), Model 2 (Seamless).

a. Width: 1-3/4 inches.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: 0.053-inch- thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Wood Doors: 0.053-inch- thick steel sheet.
4. Frames for Borrowed Lights: 0.053-inch-thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

D. Terminated Stops: On **interior** door frames, terminate stops 2 inches above finish floor with a **45**-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

1. Provide terminated stops unless otherwise indicated.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    b. Compression Type: Not less than two anchors in each jamb.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.

5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch , measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Wood-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch , measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 08 11 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.
b. Non-fire-rated coiling doors.
c. Other doors to the extent indicated.

2. Cylinders for doors specified in other Sections.
3. Electrified door hardware.

B. Related Sections include the following:

1. Division 08 Section "Hollow Metal Door Frames" for door silencers provided as part of hollow-metal frames.
2. Division 08 Section "Access Doors and Frames" for access door hardware, including cylinders.
3. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
4. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1. Pivots, thresholds, weather stripping, and cylinders for locks specified in other Sections.
2. Permanent cores to be installed by Owner.

1.3 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: Power, signal, and control wiring. Include the following:

a. System schematic.
b. Point-to-point wiring diagram.
c. Riser diagram.
d. Elevation of each door.

2. Detail interface between electrified door hardware and fire alarm, security and building control system.
3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Samples for Initial Selection: For each finish, color, and texture required for each type of door hardware indicated.

D. Samples for Verification: Submit minimum 2-by-4-inch plate Samples of each type of finish required, except primed finish.

E. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.

1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

F. Product Certificates: For electrified door hardware, signed by product manufacturer.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

G. Qualification Data: For Installer Architectural Hardware Consultant.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks, latches and closers.

I. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

J. Warranty: Special warranty specified in this Section.

K. Other Action Submittals:

1. Door Hardware Sets: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
   b. Content: Include the following information:

      1) Identification number, location, hand, fire rating, and material of each door and frame.

2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device**.**
3) Complete designations of every item required for each door or opening including name and manufacturer.
4) Fastenings and other pertinent information.
5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
6) Explanation of abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for door hardware.
8) Door and frame sizes and materials.
9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

10) List of related door devices specified in other Sections for each door and frame.

c. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
d. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
2. Installer shall have warehousing facilities in Project's vicinity.
3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting

services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.6 COORDINATION

A. Coordinate layout and installation of recessed items with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to [power supplies, fire alarm system and detection devices, security system, building control system.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Two years from date of Substantial Completion:

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated at the end of this section and where indicated in the door and frame schedule.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 HINGES, GENERAL

A. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches.
2. Three Hinges: For doors with heights 61 to 90 inches.
3. Four Hinges: For doors with heights 91 to 120 inches.
4. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Weight: Unless otherwise indicated, provide the following:

1. Entrance Doors: Heavy-weight hinges.
2. Doors with Closers: Antifriction-bearing hinges.
3. Interior Doors: Standard-weight hinges.

D. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Interior Hinges: Stainless steel, with stainless-steel pin.

E. Hinge Options: Where indicated in door hardware sets or on Drawings:

1. Decorator Tips: Oval.
2. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors.
3. Corners: Square.

F. Electrified Functions for Hinges: Comply with the following:

1. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
2. Monitoring: Concealed electrical monitoring switch.
3. Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

G. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

A. Butts and Hinges: BHMA A156.1.

B. Template Hinge Dimensions: BHMA A156.7.

C. Manufacturers:

1. Baldwin Hardware Corporation (BH).
2. Bommer Industries, Inc. (BI).
3. Lawrence Brothers, Inc. (LB).
4. McKinney Products Company; an ASSA ABLOY Group company (MCK).
5. PBB, Inc. (PBB).
6. Hager Companies.

2.4 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
3. Deadbolts: Minimum 1-inch bolt throw.

C. Backset: 2-3/4 inches, unless otherwise indicated.

D. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Bored Locks and Latches: BHMA A156.2.
2. Strikes for Mortise Locks and Latches: BHMA A156.13.
3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
5. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
6. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
7. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

2.5 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5**,** Grade 1.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.
2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
4. Bored-Lock Type: Cylinders with tailpieces to suit locks.

    a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).

C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
2. Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.

D. Construction Keying: Comply with the following:

1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

    a. Replace construction cores with permanent cores as directed by Owner.

b. Furnish permanent cores to Owner for installation.

E. Manufacturer: Same manufacturer as for locks and latches.

F. Manufacturers:
1. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
2. Best Access Systems; Div. of The Stanley Works (BAS).
3. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
4. Hager Companies (HGR).

2.6 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
1. Key locks to owner's master-key system.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: "DO NOT DUPLICATE."

2. Quantity: In addition to one extra key blank for each lock, provide the following:

a. Cylinder Change Keys: Three.
b. Master Keys: Five.
c. Grand Master Keys: Five.
d. Great-Grand Master Keys: Five.

2.7 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with ANSI A117.1.

1. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

D. Surface Closers: BHMA A156.4**,** Grade 1 Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

1. Manufacturers:
   a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
   b. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
   c. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
   d. Hager Companies (HGR).

2.8 STOPS AND HOLDERS

A. Stops and Bumpers: BHMA A156.16**,** Grade 1.

1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

B. Mechanical Door Holders: BHMA A156.16**,** Grade 1.

C. Combination Floor and Wall Stops and Holders: BHMA A156.8**,** Grade 1.

D. Combination Overhead Stops and Holders: BHMA A156.8**,** Grade 1.

E. Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch; fabricated for drilled-in application to frame.

F. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

G. Manufacturers:

1. Architectural Builders Hardware Mfg., Inc. (ABH).
2. Baldwin Hardware Corporation (BH).
3. Don-Jo Mfg., Inc. (DJO).
4. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
5. Hiawatha, Inc. (HIA).
6. Hager Companies (HGR).

2.9 PUSH-PULL PLATES

A. Basis of desig: Ives
1. 8200 Push Plate 8x16; 626 Satin Chrome finish
2. 8302 Pull Plate 4x16 with 8102 Pull 10” Centers; 626 Satin Chrome Finish

2.10 KICK PLATE

A. Basis of Design: Ives

1. 8400 Series Kick plate 10” high; Finish 630 Stainless Steel, locate on push side of door.

2.11 ELECTRIC STRIKE

A. Von Duprin 6211 heavy-duty electric strike, 24 volt and all necessary conduit and wiring back to control panel in Central Chase for complete system.

2.12 DOOR GASKETING

A. Standard: BHMA A156.22.

B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

G. Manufacturers:
1. M-D Building Products, Inc. (MD).
2. National Guard Products (NGP).
3. Reese Enterprises (RE).
4. Hager Companies (HGR).

2.13 THRESHOLDS

A. Standard: BHMA A156.21.

B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with ANSI A117.1.

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 3/8 inch high for exterior sliding doors.

C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 3/8 inch high.

D. Manufacturers:

1. National Guard Products (NGP).
2. Pemko Manufacturing Co. (PEM).
3. Reese Enterprises (RE).
4. Hager Companies (HGR).

2.14 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.7 DOOR HARDWARE SETS

HG1 – RESTROOM ENTRY DOORS
HINGE SL24HD
LOCK: SCHLAGE B563 CLASSROOM FUNCTION, SCHLAGE C KEYWAY
DEADBOLT (KEYED EXTERIOR, THUMB TURN RETRACT ON INTERIOR, INTERIOR CANNOT PROJECT)
ELECTRIC STRIKE (COORDINATE WITH OWNER FOR REMOTE/TIMED ACCESS)
CLOSER 8916 SDST
PUSH/PULL PLATES
KICKPLATE 12
THRESHOLD 425
JAMB SEAL 700S
SWEEP 675
RAIN DRIP 16AD

HG2 – SERVICE/CHASE DOORS
HINGE SL24HD
LOCK: LEVER HANDLE, STOREROOM FUNCTION
SCHLAGE AL SERIES, GRADE 2 COMMERCIAL, SATURN HANDLE, 626 FINISH
CLOSER 8916 SDST
KICKPLATE 12
THRESHOLD 425
JAMB SEAL 700S
SWEEP 675
RAIN DRIP 16AD

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: 51 lb f/sq. outward, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For insulating glass.
3) For laminated-glass lites.

d. Minimum Glass Thickness for Exterior Lites: Not less than ¼ inch.
e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
2. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
b. Solar Heat Gain Coefficient: NFRC 200.
c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

C. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Insulating glass for each designation indicated.
2. For each color (except black) of exposed glazing sealant indicated.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

F. Qualification Data: For installers.

G. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

H. Product Test Reports: For each of the following types of glazing products:

1. Insulating glass.
2. Glazing sealants.
3. Glazing gaskets.

I. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
2. Glass Testing Agency Qualifications: An independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

F. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

G. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
3. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
4. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified in other part 2 sections.

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

a. Products:

1) AFG Industries Inc.; Krystal Klear.
2) Pilkington Building Products North America; Optiwhite.
3) PPG Industries, Inc.; Starphire.
4) Approved Product.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.

3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Manufacturer's standard sealants.
    b. Polyisobutylene and polysulfide.
    c. Polyisobutylene and silicone.
    d. Polyisobutylene and hot-melt butyl.
    e. Polyisobutylene and polyurethane.

5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

    a. Spacer Material: Aluminum with bronze, color anodic finish.
    b. Desiccant: Molecular sieve or silica gel, or blend of both.
    c. Corner Construction: Manufacturer's standard corner construction.

2.3 GLAZING GASKETS

A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

H. Film: 3m Security Film, or equal.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units: Class 1 (clear) Kind FT (fully tempered) float glass.

1. Thickness: 3/8 inch.

2.9 INSULATING-GLASS UNITS

A. Passive Solar Low-E Insulating-Glass Units:

1. Products:

a. PPG & AFG Low-e Products.

2. Overall Unit Thickness and Thickness of Each Lite: Approximately 1 inch, 0.25 inch.
3. Interspace Content: Argon.
4. Outdoor Lite: Class 2 float glass.

a. Tint Color: Clear.
b. Kind FT (fully tempered): Where required by code.

5. Indoor Lite: Class 1 (clear) float glass.

a. Kind FT (fully tempered). Where required by code.

6. Low-E Coating: Pyrolytic on second and fifth surface.
7. Winter Nighttime U-Factor: 0.35 maximum.
8. Summer Daytime U-Factor: 0.38 maximum.
9. Solar Heat Gain Coefficient: 0.61 maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel.
2. Galvanized metal.
3. Wood.

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
3. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. Benjamin Moore & Co., Limited (Canada).
3. Bennette Paint Mfg. Co., Inc.
4. BLP Mobile Paint Manufacturing.
5. California Paints.
6. ChemRex.
7. Cloverdale Paint.
8. Color Wheel Paints & Coatings.
9. Columbia Paint & Coatings.
10. Coronado Paint.
11. Davis Paint Company.
12. Del Technical Coatings.
13. Diamond Vogel Paints.
14. Dunn-Edwards Corporation.
15. Durant Paints Inc.
16. Duron, Inc.
17. Envirocoat Technologies Inc.
18. Farrell-Calhoun.
19. Flex Bon Paints.
20. Frazee Paint.
21. General Paint.
22. Griggs Paint.
23. Hallman Lindsay Quality Paints.
24. Hirshfield's, Inc.
25. ICI Devoe (Canada).
26. ICI Paints.
27. ICI Paints (Canada).
28. Insl-x.
29. Iowa Paint Manufacturing Company, Inc.
30. Kelly-Moore Paints.
31. Kryton Canada Corporation.
32. Kwal-Howells Paint.
33. M.A.B. Paints.
34. McCormick Paints.
35. Miller Paint.
36. Mills Paint.
37. NCP Coatings.
38. Northern Paint.
39. PARA Paints.
40. Parker Paint Mfg. Co. Inc.
41. Porter Paints.
42. PPG Architectural Finishes, Inc.
43. Rodda Paint Co.

44. Sherwin-Williams Company (The).
45. Sico, Inc.
46. Sigma Coatings.
47. Smiland Paint Company.
48. Spectra-Tone.
49. Tamms Industries, Inc.
50. Tower Paint.
51. Vista Paint.
52. Approved Manufacturer.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS

A. Alkali-Resistant Primer: MPI #3.

1. VOC Content: E Range of E2.

B. Bonding Primer (Water Based): MPI #17.

1. VOC Content: E Range of E2.

C. Bonding Primer (Solvent Based): MPI #69.

1. VOC Content: E Range of E2.

D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.5 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E2.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E2.

C. Cementitious Galvanized-Metal Primer: MPI #26.

1. VOC Content: E Range of E1.

D. Waterborne Galvanized-Metal Primer: MPI #134.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

E. Quick-Drying Primer for Aluminum: MPI #95.

1. VOC Content: E Range of E2.

2.6 WOOD PRIMERS

A. Exterior Latex Wood Primer: MPI #6.

1. VOC Content: E Range of E2.

B. Exterior Alkyd Wood Primer: MPI #5.

1. VOC Content: E Range of E2.

C. Exterior Oil Wood Primer: MPI #7.

1. VOC Content: E Range of E2.

2.7 EXTERIOR LATEX PAINTS

A. Exterior Latex (Flat): MPI #10 (Gloss Level 1).

1. VOC Content: E Range of E2.

B. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

1. VOC Content: E Range of E2.

C. Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

1. VOC Content: E Range of E2.

2.8 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).

1. VOC Content: E Range of E1.

B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

1. VOC Content: E Range of E2.

C. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).

1. VOC Content: E Range of E2.

2.9 QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

1. VOC Content: E Range of E2.

B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

1. VOC Content: E Range of E2.

2.10 ALUMINUM PAINT

A. Aluminum Paint: MPI #1.

1. VOC Content: E Range of E2.

2.11 FLOOR COATINGS

A. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.

1. VOC Content: E Range of E2.

B. Interior/Exterior Clear Concrete Floor Sealer (Solvent Based): MPI #104.

1. VOC Content: E Range of E2.

C. Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 3.

D. Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).

1. VOC Content: E Range of E2.

2. Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

M. Exterior Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System: MPI EXT 3.1A.

   a. Prime Coat: Exterior latex matching topcoat.
   b. Intermediate Coat: Exterior latex matching topcoat.
   c. Topcoat: Exterior latex (flat).

2. Latex Aggregate/Latex System: MPI EXT 3.1 B.

   a. Prime Coat: Latex stucco and masonry textured coating.

b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (flat).

3. Latex Over Alkali-Resistant Primer System: MPI EXT 3.1K.

a. Prime Coat: Alkali-resistant primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (flat).

4. High-Build Latex System: MPI EXT 3.1L, applied to form dry film thickness of not less than 10 mils.

a. Prime Coat: As recommended in writing by topcoat manufacturer.
b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
c. Topcoat: High-build latex (exterior).

5. Latex Aggregate System: MPI EXT 3.1N.

a. Prime Coat: As recommended in writing by topcoat manufacturer.
b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
c. Topcoat: Latex stucco and masonry textured coating.

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Paint System: MPI EXT 3.2A.

a. Prime Coat: Interior/exterior latex floor and porch paint (low gloss).
b. Intermediate Coat: Interior/exterior latex floor and porch paint (low gloss).
c. Topcoat: Interior/exterior latex floor and porch paint (low gloss).

2. Alkyd Floor Enamel System: MPI EXT 3.2D.

a. Prime Coat: Exterior/interior alkyd floor enamel (gloss).
b. Intermediate Coat: Exterior/interior alkyd floor enamel (gloss).
c. Topcoat: Exterior/interior alkyd floor enamel (gloss).

3. Clear Sealer System: MPI EXT 3.2G.

a. Prime Coat: Interior/exterior clear concrete floor sealer (solvent based).
b. Intermediate Coat: Interior/exterior clear concrete floor sealer (solvent based).
c. Topcoat: Interior/exterior clear concrete floor sealer (solvent based).

4. Water-Based Clear Sealer System: MPI EXT 3.2H.

a. Prime Coat: Interior/exterior clear concrete floor sealer (water based).
b. Intermediate Coat: Interior/exterior clear concrete floor sealer (water based).
c. Topcoat: Interior/exterior clear concrete floor sealer (water based).

C. CMU Substrates:

1. Latex System: MPI EXT 4.2A.

a. Prime Coat: Interior/exterior latex block filler.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (flat).

2. Latex Over Alkali-Resistant Primer System: MPI EXT 4.2L.

a. Prime Coat: Alkali-resistant primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (flat).

3. High-Build Latex System: MPI EXT 4.2K, applied to form dry film thickness of not less than 10 mils.

a. Prime Coat: As recommended in writing by topcoat manufacturer.
b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
c. Topcoat: High-build latex (exterior).

4. Latex Aggregate System: MPI EXT 4.2B.

a. Prime Coat: As recommended in writing by topcoat manufacturer.
b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
c. Topcoat: Latex stucco and masonry textured coating.

D. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel (semigloss).

2. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel (semigloss).

3. Aluminum Paint System: MPI EXT 5.1K.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Aluminum paint.
c. Topcoat: Aluminum paint.

E. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3A.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (semigloss).

2. Latex Over Water-Based Primer System: MPI EXT 5.3H.

a. Prime Coat: Waterborne galvanized-metal primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (semigloss).

3. Alkyd System: MPI EXT 5.3B.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel (semigloss).

F. Wood Panel Substrates: Including fascias and soffits.

1. Latex System: MPI EXT 6.4K.

a. Prime Coat: Exterior latex wood primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (flat).

2. Latex Over Alkyd Primer System: MPI EXT 6.4G.

a. Prime Coat: Exterior alkyd wood primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (flat).

3. Alkyd System: MPI EXT 6.4B.

a. Prime Coat: Exterior oil wood primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel (flat).

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. CMU " Concrete Masonry Units" Interior Side

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
3. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. Benjamin Moore & Co., Limited (Canada).
3. Bennette Paint Mfg. Co., Inc.
4. BLP Mobile Paint Manufacturing.
5. California Paints.
6. ChemRex.
7. Cloverdale Paint.
8. Color Wheel Paints & Coatings.
9. Columbia Paint & Coatings.
10. Coronado Paint.
11. Davis Paint Company.
12. Diamond Vogel Paints.
13. Dunn-Edwards Corporation.
14. Durant Paints Inc.
15. Duron, Inc.
16. Envirocoat Technologies Inc.
17. Farrell-Calhoun.
18. Flex Bon Paints.
19. Frazee Paint.
20. General Paint.
21. Griggs Paint.
22. Hallman Lindsay Quality Paints.
23. Hirshfield's, Inc.
24. ICI Devoe (Canada).
25. ICI Paints.
26. ICI Paints (Canada).
27. Insl-x.
28. Iowa Paint Manufacturing Company, Inc.
29. Kelly-Moore Paints.
30. Kryton Canada Corporation.
31. Kwal-Howells Paint.
32. M.A.B. Paints.
33. McCormick Paints.
34. Miller Paint.
35. Mills Paint.
36. Northern Paint.
37. PARA Paints.
38. Parker Paint Mfg. Co. Inc.
39. Porter Paints.

40. PPG Architectural Finishes, Inc.
41. Rodda Paint Co.
42. Sherwin-Williams Company (The).
43. Sico, Inc.
44. Sigma Coatings.
45. Smiland Paint Company.
46. Spectra-Tone.
47. Sterling Paint.
48. Tamms Industries, Inc.
49. Tower Paint.
50. Vista Paint.
51. Approved Manufacturer.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.

o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

B. Interior Alkyd Primer/Sealer: MPI #45.

1. VOC Content: E Range of E2.

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E2.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E2.

C. Rust-Inhibitive Primer (Water Based): MPI #107.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

D. Cementitious Galvanized-Metal Primer: MPI #26.

1. VOC Content: E Range of E1.

E. Waterborne Galvanized-Metal Primer: MPI #134.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

F. Vinyl Wash Primer: MPI #80.

1. VOC Content: E Range of E2.

G. Quick-Drying Primer for Aluminum: MPI #95.

1. VOC Content: E Range of E2.

2.6 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

2.7 LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 1.5.

B. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

C. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

D. Interior Latex (Satin): MPI #43 (Gloss Level 4).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

E. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

F. Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

G. Exterior Latex (Flat): MPI #10 (Gloss Level 1).

1. VOC Content: E Range of E2.

H. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

1. VOC Content: E Range of E2.

I. Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

1. VOC Content: E Range of E2.

2.8 ALKYD PAINTS

A. Interior Alkyd (Flat): MPI #49 (Gloss Level 1).

1. VOC Content: E Range of E2.

B. Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).

1. VOC Content: E Range of E2.

C. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

D. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).

1. VOC Content: E Range of E2.

2.9 QUICK-DRYING ENAMELS

A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

1. VOC Content: E Range of E2.

B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

1. VOC Content: E Range of E2.

2.10 ALUMINUM PAINT

A. Aluminum Paint: MPI #1.

1. VOC Content: E Range of E2.

2.11 FLOOR COATINGS

A. Interior Concrete Floor Stain: MPI #58.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

B. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.

1. VOC Content: E Range of E2.

C. Interior/Exterior Clear Concrete Floor Sealer (Solvent Based): MPI #104.

1. VOC Content: E Range of E2.

D. Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 3.

E. Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).

1. VOC Content: E Range of E2.
2. Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.

3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

M. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
h. As indicated in Room Finish Schedule

2. Electrical Work:

    a. Switchgear.
    b. Panelboards.
    c. Electrical equipment that is indicated to have a factory-primed finish for field painting.
    d. As indicated in Room Finish Schedule.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System: MPI INT 3.1E.

    a. Prime Coat: Interior latex matching topcoat.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (low sheen).

2. Latex Over Sealer System: MPI INT 3.1A.

    a. Prime Coat: Interior latex primer/sealer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (low sheen).

3. Latex Over Latex Aggregate System: MPI INT 3.1B.

    a. Prime Coat: Latex stucco and masonry textured coating.
    b. Intermediate Coat: Exterior latex matching topcoat.
    c. Topcoat: Exterior latex (semigloss).

4. Alkyd System: MPI INT 3.1D.

    a. Prime Coat: Interior latex primer/sealer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd (semigloss).

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Enamel System: MPI INT 3.2A.

    a. Prime Coat: Interior/exterior latex floor and porch paint (gloss).
    b. Intermediate Coat: Interior/exterior latex floor and porch paint (gloss).
    c. Topcoat: Interior/exterior latex floor and porch paint (gloss).

2. Alkyd Floor Enamel System: MPI INT 3.2B.

    a. Prime Coat: Exterior/interior alkyd floor enamel (gloss).
    b. Intermediate Coat: Exterior/interior alkyd floor enamel (gloss).
    c. Topcoat: Exterior/interior alkyd floor enamel (gloss).

3. Concrete Stain System: MPI INT 3.2E.

    a. First Coat: Interior concrete floor stain.
    b. Topcoat: Interior concrete floor stain.

4. Clear Sealer System: MPI INT 3.2F.

    a. First Coat: Interior/exterior clear concrete floor sealer (solvent based).
    b. Topcoat: Interior/exterior clear concrete floor sealer (solvent based).

5. Water-Based Clear Sealer System: MPI INT 3.2G.

    a. First Coat: Interior/exterior clear concrete floor sealer (water based).
    b. Topcoat: Interior/exterior clear concrete floor sealer (water based).

C. CMU Substrates:

1. Latex System: MPI INT 4.2A.

    a. Prime Coat: Interior/exterior latex block filler.

b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (eggshell).

2. Alkyd System: MPI INT 4.2C.

a. Prime Coat: Interior/exterior latex block filler.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (eggshell).

3. Alkyd Over Latex Sealer System: MPI INT 4.2N.

a. Prime Coat: Interior/exterior latex block filler.
b. Sealer Coat: Interior latex primer/sealer.
c. Intermediate Coat: Interior alkyd matching topcoat.
d. Topcoat: Interior alkyd (eggshell).

D. Steel Substrates:

1. Quick-Drying Enamel System: MPI INT 5.1A.

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel (semigloss).

E. Gypsum Board Substrates:

1. Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (eggshell).

2. Alkyd Over Latex Primer System: MPI INT 9.2C.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (eggshell).

END OF SECTION 09 91 23

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Panel signs.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
3. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
4. Division 26 Sections for electrical service and connections for illuminated signs.
5. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
6. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:

1. Aluminum.
2. Acrylic sheet.
3. Polycarbonate sheet.
4. Fiberglass sheet.
5. Die-cut vinyl characters and graphic symbols. Include representative samples of available typestyles and graphic symbols.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
2. Aluminum: For each form, finish, and color, on 6-inch- long sections of extrusions and squares of sheet at least 4 by 4 inches.
3. Acrylic Sheet: 8 by 10 inches for each color required.
4. Polycarbonate Sheet: 8 by 10 inches for each color required.
5. Fiberglass Sheet: 8 by 10 inches for each color required.
6. Panel Signs: Not less than 12 inches square including border.
7. Trim, Frame: 6-inch- long sections of each profile.
8. Accessories: Manufacturer's full-size unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For fabricator.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products. An employer of workers trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metal and polymer finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ADA SIGNAGE

A. Provide ADA compliant restroom signage at exterior wall to match signage at existing Trailhead restrooms (Photos below).

B. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Opaque acrylic sheet.
2. Raised-Copy Thickness: Not less than 1/32 inch.

2.2 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where directed by Architect. Provide one sign for each interior door and interior opening, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Flush Mounting: Mount characters with backs in contact with wall surface.
2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10 14 00

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Public-use washroom accessories.
2. Childcare accessories.
3. Under lavatory guards.
4. Custodial accessories.
5. Toilet tissue holders.
6. Paper towel dispensers.
7. Soap dispensers.
8. Waste receptacles

B. Related Sections include the following:

1. Division 08 Section "Mirrors" for frameless mirrors.
2. Division 09 Section "Tiling" for ceramic toilet and bath accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, minimum nominal thickness, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).
6. Or equal.

B. Partitions:
1. Material: Solid Color Reinforced Composite (SCRC)
2. Height: 58” Standard panels
3. Mounting: Floor Anchored
4. Color: TBD, owner to select from stock color options
5. Shop drawings required for approval

C. Grab Bar:

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

3. Outside Diameter: 1-1/2 inches.
4. Configuration and Length: As indicated on Drawings.

D. Sanitary-Napkin Disposal Unit:

1. Mounting: Recessed.
2. Door or Cover: Self-closing disposal-opening cover and hinged face panel with tumbler lockset.
3. Receptacle: Removable.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

E. Seat-Cover Dispenser:

1. Mounting: Recessed.
2. Minimum Capacity: 250 seat covers.
3. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
4. Lockset: Tumbler type.

F. Mirror Unit:
1. Frame: Stainless-steel angle, 0.05 inch thick.

a. Corners: Welded and ground smooth.

2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

3. Size: As indicated on Drawings.

G. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Bobrick.
2. Description: Double-roll dispenser.
3. Mounting: Surface mounted.
4. Operation: Noncontrol delivery with theft-resistant spindle.
5. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Combination Towel (Folded) Dispenser/Waste Receptacle:

1. Basis-of-Design Product: Bobrick.
2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
3. Mounting: Recessed.

a. Designed for nominal 4-inch wall depth.

4. Minimum Towel-Dispenser Capacity: 600 C-fold paper towels.
5. Minimum Waste-Receptacle Capacity: 4 gal.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner.
8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.

I. Liquid-Soap Dispenser:

1. Provided by owner. Installed by contractor.

2.3 CHILDCARE ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Infant Care Products Inc.
2. American Specialties, Inc.
3. Brocar Products, Inc.
4. General Accessory Manufacturing Co. (GAMCO).
5. Koala Corporation.
6. Safe-Strap Company, Inc.
7. Approved Manufacturer.

B. Diaper-Changing Station:

1. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.

a. Engineered to support a minimum of 250-lb static load when opened.

2. Mounting: Semirecessed, with unit projecting not more than 1 inches from wall when closed.
3. Operation: By pneumatic shock-absorbing mechanism.
4. Material and Finish: High-density polyethylene in manufacturer's standard color.
5. Liner Dispenser: Built in.

2.4 UNDER LAVATORY GUARDS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. TCI Products.
3. Truebro, Inc.
4. Approved Manufacturer.

D. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded-plastic, white.

2.5 CUSTODIAL ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).
6. Approved Manufacturer.

B. Utility Shelf:

1. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
2. Size: 16 inches long by 6 inches deep.
3. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).

C. Mop and Broom Holder:

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
2. Length: 36 inches.
3. Hooks: Three.
4. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 300 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:

1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

C. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International Ltd.
c. Badger Fire Protection; a Kidde company.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
h. Larsen's Manufacturing Company.
i. Moon-American.
j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
k. Potter Roemer LLC.
l. Pyro-Chem; Tyco Safety Products.
m. Approved Manufacturer.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Regular Dry-Chemical Type in Aluminum Container: UL-rated 10-B:C, 5-lb, 60-B:C, 10-lb nominal capacity, with sodium bicarbonate-based dry chemical in enameled-aluminum container.

C. Multipurpose Dry-Chemical Type in Aluminum Container: UL-rated 2-A:10-B:C, 5-lb, 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

D. Halon Type: UL-rated 10-B:C, 5-lb nominal capacity, in enameled-steel container; with pressure-indicating gage.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International Ltd.
c. Badger Fire Protection; a Kidde company.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
g. Larsen's Manufacturing Company.
h. Potter Roemer LLC.
i. Approved Manufacturer.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16

SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Transition fittings.
   3. Dielectric fittings.
   4. Mechanical sleeve seals.
   5. Sleeves.
   6. Escutcheons.
   7. Grout.
   8. Equipment installation requirements common to equipment sections.
   9. Painting and finishing.
   10. Concrete bases.
   11. Supports and anchorages.

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   1. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.03 QUALITY ASSURANCE

A. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.05 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

D. Coordination Meetings: Attend coordination meetings with the construction manager and all other trades for the purpose of coordinating the locations of all fire protection, plumbing, HVAC and electrical work for the entire project. The goal of these meetings is to avoid conflicts between trades in the field.

1. Conflicts Between Trades: Resolve all conflicts with other trades at no additional cost to the Owner or Architect.

E. Ceiling Heights: Maintain all ceiling heights indicated on the architectural drawings. Ceiling heights will not be lowered to accommodate installation of fire protection, plumbing, HVAC or electrical work. Install all work so that there is at least eight (8) inches clearance above the ceiling grid, in all areas, to facilitate installation of light fixtures. If installed work does not comply with the ceiling height requirements stated above, then the contractor shall remove and re-install work to comply with the stated requirements above at no additional cost to the Owner or Architect.

F. This Contractor shall completely cooperate with all other trades in the matter of planning and executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay or obstruct the work of any trade.

1.06 INTENT OF DRAWINGS AND SPECIFICATIONS

A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practices of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. The drawings depicting plumbing work are diagrammatic and show, in their approximate location, symbols representing plumbing equipment and devices. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect and/or established by manufacturer’s installation drawings and details.

1. The Contractor shall refer to shop drawings and submittal drawings for all equipment requiring plumbing connections to verify rough-in and connection locations.
2. Unless specifically stated to the contrary, no measurement of a plumbing drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the plumbing

drawings are subject to measurements of adjacent and previously completed work. All measurements shall be performed prior to the actual installation of equipment.

C. The plumbing drawings do not attempt to show the complete details of building construction which affect the plumbing installation. The Contractor shall refer to plans of other trades for additional details which affect the proper installation of this work. Bring any discrepancies to the attention of the A/E for resolution. The Contractor is cautioned that diagrams showing plumbing connections and/or piping are diagrammatic only and must not be used for obtaining lineal runs of piping. Piping diagrams do not necessarily show the exact physical arrangement of the equipment

1.07 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of the building and site, which may affect the execution of his work. No extra payment will be allowed for the failure to obtain this information. If in the opinion of the Contractor there are omissions or errors in the plans or specifications, the Contractor shall clarify these points with the Engineer before submitting his bid. In lieu of written clarification by addendum, the contractor shall resolve all conflicts in favor of the greater quantity or better quality.

PART 2 PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.03 TRANSITION COUPLINGS:

A. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Unshielded, Nonpressure Transition Couplings: ASTM C 1173; elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   1. Sleeve Materials:
      a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

D. Shielded, Nonpressure Transition Couplings: ASTM C 1460; elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Pressure Transition Couplings: AWWA C219; corrosion-resistant metal sleeve-type with ductile iron center-sleeve and rubber gasket. Coupling shall be same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

2.04 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: ASSE 1079; factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: ASSE 1079; factory-fabricated, bolted, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Nipples: IAPMO PS 66; electroplated steel nipple complying with ASTM F 1545 with inert and noncorrosive, propylene lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.05 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Advance Products & Systems, Inc.
   2. Metraflex Co.
   3. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, for filling annular space between pipe and sleeve.
   1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Glass-reinforced plastic.

3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.06 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD

2.07 SLEEVES

A. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

E. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
   1. Underdeck Clamp: Clamping ring with set screws.

F. Molded PVC Sleeves: With nailing flange for attaching to wooden forms.

G. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

H. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.08 ESCUTCHEONS AND FLOOR PLATES

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish and spring-clip fasteners.

C. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

D. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

E. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

F. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

G. One-Piece, Floor-Plates: Cast-iron floor plate.

H. Split-Casting, Floor-Plates: Cast brass with concealed hinge.

2.09 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
   1. Escutcheons for New Piping: One-piece, cast-brass type with polished, chrome-plated finish, except as follows:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
      b. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
      c. Bare Piping in Unfinished Service Spaces and Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated or rough-brass finish.
   2. Escutcheons for Existing Piping: Split-casting brass type with polished, chrome-plated finish, except as follows:
      a. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
      b. Bare Piping in Unfinished Service Spaces and Equipment Rooms: Split-casting brass type with polished, chrome-plated or rough-brass finish.

M. Install floor plates for piping penetrations of equipment-room floors.

N. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. New Piping: One-piece, floor-plate type.

2. Existing Piping: Split-casting, floor-plate type.

3.02 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
   2. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
   3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.03 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.
   1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
   3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
   4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.04 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.05 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.06 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   3. PVC Nonpressure Piping: Join according to ASTM D 2855.

G. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

H. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.07 PIPING CONNECTIONS

A. Verify final equipment locations for roughing-in.

B. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

C. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.08 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.09 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.10 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.
   6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
   7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3.

3.11 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.12 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.13 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 22 05 19 – METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Liquid-in-glass thermometers.
   2. Thermowells.
   3. Gage attachments.
   4. Test plugs.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. H.O. Trerice.
   2. Miljoco Corporation
   3. Weiss Instruments.

2.02 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
   1. Standard: ASME B40.200.
   2. Case: Cast aluminum; 6-inch nominal size.
   3. Case Form: Back angle unless otherwise indicated.
   4. Tube: Glass with magnifying lens and blue organic liquid.
   5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
   6. Window: Glass or plastic.
   7. Stem: Brass or stainless steel and of length to suit installation.
   8. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
   1. Standard: ASME B40.200.
   2. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
   3. Case Form: Adjustable angle unless otherwise indicated.
   4. Tube: Glass with magnifying lens and blue or red organic liquid.

5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass or plastic.
7. Stem: Brass or stainless steel and of length to suit installation.
8. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.03 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: Lead-free brass.
4. Material for Use with Steel Piping: 304 stainless steel.
5. Bore: Diameter required to match thermometer bulb or stem.
6. Insertion Length: Length required to match thermometer bulb or stem.
7. Lagging Extension: Include on thermowells for insulated piping and tubing.

2.04 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Standard: ASME B40.100.
2. Case: Sealed type(s); Aluminum; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Scale Range: 0 to 100 psi.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.05 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with porous-metal-type surge-dampening device. Match size with pressure gages. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle.

2.06 TEST PLUGS

A. Description: Test-station fitting made for insertion into piping tee fitting.

B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: EPDM self-sealing rubber.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install valve and snubber in piping for each pressure gage for fluids.

G. Install test plugs in piping tees.

H. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.

3.02 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.03 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.04 THERMOMETER SCALE-RANGE SCHEDULE

Service	Scale Range
Domestic Cold-Water	30 to 130 deg F
Domestic Hot-Water	30 to 180 deg F

END OF SECTION 22 05 19

SECTION 22 05 23 – GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Bronze ball valves.
   2. Bronze swing check valves.
   3. Bronze gate valves.

1.02 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. OS&Y: Outside screw and yoke.

D. RS: Rising stem.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   2. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.
   4. Set ball and plug valves open to minimize exposure of functional surfaces.
   5. Block check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
   1. Handwheel: For valves other than quarter-turn types.
   2. Handlever: For quarter-turn valves .

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
   1. Gate Valves: With rising stem.
   2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: With extended neck.

F. Valve-End Connections:
   1. Threaded: With threads according to ASME B1.20.1.

2.02 BRONZE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ball Valves: Apollo Valves, Hammond Valve, Milwaukee Valve Company, NIBCO.
   2. Gate Valves: Hammond Valve, Milwaukee Valve Company, NIBCO.
   3. Check Valves: Hammond Valve, Milwaukee Valve Company, NIBCO, Watts.

B. Bronze Ball Valves: MSS SP-110, two-piece bronze body with threaded ends, chrome-plated bronze ball, PTFE or TFE seat, 600 psig minimum CWP rating and blowout-proof bronze stem.
   1. NPS 2 and smaller: Full port.
   2. NPS 2-1/2 – NPS 3: Conventional port.

C. Rising Stem Gate Valves: MSS SP-80, Type 2, Class 125. ASTM B 62 bronze body with integral seat and screw-in bonnet; 200 psig minimum CWP rating; threaded ends; bronze stem, solid bronze wedge; graphite packing; malleable iron handwheel

D. Bronze Swing Check Valves: MSS SP-80, Type 3, Class 125. ASTM B 62 bronze body with renewable bronze disc and seat, threaded ends; suitable for installation in a horizontal or vertical line with upward flow..

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level or in vertical piping with upward flow.
2. Silent Check Valves: In horizontal or vertical position, between flanges.

3.03 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.
2. Throttling Service: Ball valves.
3. Pump-Discharge Check Valves:
   a. NPS 1-1/2 and Smaller: Bronze swing check valves.

3.05 VALVE APPLICATIONS

A. Water Supply and Return Piping:
1. Shutoff and Throttling Service:
   a. NPS 2 and Smaller: Bronze two-piece ball valves.

END OF SECTION

SECTION 22 05 29 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Metal framing systems.
3. Fastener systems.
4. Pipe stands.
5. Pipe positioning systems.

1.02 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.02 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cooper B-Line, Inc.
   b. Flex-Strut Inc.
   c. Unistrut Corporation; Tyco International, Ltd.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel .
7. Metallic Coating: Electroplated zinc.

2.03 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.04 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.05 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.06 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

K. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.05 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

L. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 07 19 – PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Sanitary waste piping exposed to freezing conditions.
5. Supplies and drains for handicap-accessible lavatories and sinks.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application.

C. Coordinate installation and testing of heat tracing.

1.07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Johns Manville; Micro-Lok HP.
   b. Knauf Insulation; 1000-Degree Pipe Insulation with ECOSE Technology
   c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.03 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. VOC limit for indoor applications: 80 g/L.

D. ASJ Adhesive Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. VOC limit for indoor applications: 50 g/L.

E. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. VOC limit for indoor applications: 50 g/L.

2.04 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
   1. VOC limit for indoor applications: 50 g/L.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

   1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: 60 percent by volume and 66 percent by weight.
   4. Color: White.

2.05 SEALANTS

A. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.
   4. Color: White.
   5. VOC limit for indoor applications: 420 g/L.

2.06 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.07 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

2.08 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

   1. Width: 3 inches.
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.09 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. McGuire Manufacturing.
   b. Truebro; a brand of IPS Corporation.
   c. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.04 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.05 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for

above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.06 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.07 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.09 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:
   1. Insulation Material: Mineral fiber
   2. Insulation Thickness: 1 inch thick minimum.
   3. Vapor Barrier Required: Yes.

B. Domestic Hot and Recirculated Hot Water:
   1. Insulation Material: Mineral fiber
   2. Insulation Thickness:
      a. NPS 1-1/2 and Smaller: 1 inch thick minimum.
   3. Vapor Barrier Required: No.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
   1. Insulation Material: Mineral fiber
   2. Insulation Thickness: 1/2 inch thick minimum.
   3. Field-Applied Jacket: PVC on exposed piping in mechanical rooms or within 10' of floor in occupied spaces.

END OF SECTION

SECTION 22 11 16 – DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.02 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.03 PIPING JOINING MATERIALS

A. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

B. Solder Filler Metals: ASTM B 32, lead-free alloys.

C. Flux: ASTM B 813, water flushable.

PART 3 EXECUTION

3.01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure

gages in Division 22 Section "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Division 22 Section "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level without pitch and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Division 22 Section "Domestic Water Pumps."

Q. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Division 22 Section "Meters and Gages for Plumbing Piping."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Common Work Results for Plumbing."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Common Work Results for Plumbing."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Common Work Results for Plumbing."

3.02 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

G. Install transition couplings at joints of dissimilar piping.

H. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.03 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: MSS Type 1, adjustable, steel clevis hangers.
3. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.04 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code. Comply with requirements for connection sizes in Division 22 plumbing fixture Sections.

3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.05 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.06 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.07 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
   b. Adjust calibrated balancing valves to flows indicated.

4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.08 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:

      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Repeat procedures if biological examination shows contamination.
   e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.09 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Under-building-slab, domestic water piping, [NPS 2 (DN 50) and smaller] <Insert pipe size range>, shall be[one of] the following:

1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.

D. Aboveground domestic water piping:

1. NPS 3 and smaller: Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.

3.10 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 and larger.
2. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
3. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 11 19 – DOMESTIC WATER PIPING SPECIALITIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Balancing valves.
   2. Strainers.
   3. Drain valves.
   4. Water-hammer arresters.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.02 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.03 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Armstrong International, Inc.
      b. ITT Corporation; Bell & Gossett Div.
      c. NIBCO Inc.
      d. TACO Incorporated.
      e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

   2. Type: Ball valve with two readout ports and memory-setting indicator.
   3. Body: Bronze.
   4. Size: Same as connected piping, but not larger than NPS 2.
   5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.04 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze.
3. End Connections: Threaded.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Drain: Pipe plug.

2.05 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.06 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. MIFAB, Inc.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Watts Drainage Products.
   e. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows or copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install balancing valves in locations where they can easily be adjusted.

B. Install water-hammer arresters in water piping according to PDI-WH 201.

3.02 CONNECTIONS

A. Comply with requirements for piping specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements for ground equipment in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.04 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

END OF SECTION 221119

SECTION 22 11 23.23 – CLOSED-COUPLED, INLINE, SEALLESS CENTRIFUGAL DOMESTIC WATER PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes in-line, sealless centrifugal pumps:

1.02 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include materials of construction, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water pumps to include in operation and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

1.07 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 PRODUCTS

2.01 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Corporation.
3. Grundfos Pumps Corp.
4. TACO Incorporated.

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Casing: Bronze, with threaded or companion-flange connections.
3. Impeller: Plastic.
4. Motor: Single speed, unless otherwise indicated.

2.02 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.03 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F.
3. Enclosure: NEMA 250, Type 4X.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120-V ac.
7. Settings: Start pump at 105 deg F, adjustable and stop pump at 120 deg F, adjustable.

B. Timers: Electric, for control of hot-water circulation pump.

1. Type: Programmable, seven-day clock with manual override on-off switch.
2. Enclosure: NEMA 250, Type 1 , suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 24-V ac.
6. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of domestic-water-piping system to verify actual locations of connections before pump installation.

3.02 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.

C. Install continuous-thread hanger rods and spring hangers of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

D. Install pressure switches in water supply piping.

E. Install thermostats in hot-water return piping.

F. Install timers. Verify location with Owner.

3.03 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties."

D. Connect thermostats and timers to pumps that they control.

3.04 IDENTIFICATION

A. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.05 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set thermostats and timers] for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

   a. Verify bearing lubrication.
   b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
   c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.

10. Adjust timer settings.

3.06 ADJUSTING

A. Adjust domestic water pumps to function smoothly and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION

SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

1.02 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.03 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.02 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 EXECUTION

3.01 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving."

3.02 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install aboveground PVC piping according to ASTM D 2665.

N. Install underground PVC piping according to ASTM D 2321.

O. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Common Work Results for Plumbing."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Common Work Results for Plumbing."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Common Work Results for Plumbing."

3.03 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.04 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.

4. Install individual, straight, horizontal piping runs: MSS Type 1, adjustable, steel clevis hangers.
5. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers forPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.

F. Install supports for vertical PVC piping every 48 inches.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.05 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for, cleanouts, and drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.06 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.07 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.08 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.09 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Soil, Waste and Vent Piping: Use any of the following piping materials for each size range:

1. NPS 4 and smaller:

   a. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

      1) PVC waste pipe shall not be permitted downstream of any equipment expected to discharge fluid in excess of 140 deg F.

   b. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 13 19 – SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Floor drains.
2. Roof flashing assemblies.
3. Through-penetration firestop assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

1.02 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.01 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the products indicated or a comparable product by one of the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. FD-1: Floor drain with adjustable strainer head, flashing collar and reversible flashing collar.
    a. Fixture: Zurn Z415B
    b. Body Material: Cast Iron.
    c. Pipe Connection: 4”Ø NPS no-hub outlet.
    d. Strainer: Round, Nickel bronze with vandal proof screws.
    e. Additional Features: Sediment bucket and hinged grate.

2.02 ROOF FLASHING ASSEMBLIES

A. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.03 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets

1. Size: Same as connected waste piping.

B. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.

1. Size: Same as connected waste piping.

    a. NPS 2: 4-inch- minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection

1. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

1. Size: Same as connected stack vent or vent stack.

F. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.

1. Size: Same as connected stack vent or vent stack.

G. Frost-Resistant Vent Terminals: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel

1. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

2.04 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.

b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

C. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

G. Assemble open drain fittings and install with top of hub 1 inch above floor.

H. Install deep-seal traps on floor drains and other waste outlets, if indicated.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

O. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

P. Install wood-blocking reinforcement for wall-mounting-type specialties.

Q. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.03 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.04 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.05 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 42 13.13 – COMMERCIAL WATER CLOSETS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Water closets.
   2. Flushometer valves.
   3. Toilet seats.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
   1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

PART 2 PRODUCTS

2.01 FLOOR-MOUNTED WATER CLOSETS

A. Water Closets WC-1: Floor mounted, top spud.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

      a. American Standard America.
      b. Kohler Co.
      c. TOTO USA, INC.
      d. Zurn Industries, LLC; Commercial Brass and Fixtures.
   2. Bowl:

      a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
      b. Material: Vitreous china.
      c. Type: Siphon jet.
      d. Style: Flushometer valve.
      e. Height: See drawings
      f. Rim Contour: Elongated.
      g. Water Consumption: 1.28 gal. per flush.

h. Spud Size and Location: NPS 1-1/2; top.

2.02 FLUSHOMETER VALVES – SENSOR ACTIVATED

A. Solenoid-Actuator, Diaphragm Flushometer Valves:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Sloan Valve Company.
   b. Zurn Industries, LLC; Commercial Brass and Fixtures.
2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
10. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
11. Consumption: 1.28 gal. per flush.
12. Minimum Inlet: NPS 1.
13. Minimum Outlet: NPS 1-1/4.

2.03 TOILET SEATS

A. Toilet Seats:
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. American Standard America.
   b. Bemis Manufacturing Company.
   c. Kohler Co.
   d. Olsonite Seat Co.
   e. TOTO USA, INC.
   f. Zurn Industries, LLC; Commercial Brass and Fixtures.
2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial.
5. Shape: Elongated rim, open front.
6. Hinge: Check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.
10. Antimicrobial

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Water-Closet Installation:
   1. Install level and plumb according to roughing-in drawings.
   2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
   3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Flushometer-Valve Installation:
   1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
   2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
   3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
   4. Install actuators in locations that are easy for people with disabilities to reach.
   5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

C. Install toilet seats on water closets.

D. Wall Flange and Escutcheon Installation:
   1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
   2. Install deep-pattern escutcheons if required to conceal protruding fittings.
   3. Comply with escutcheon requirements specified in Section 22 05 00 "Common Work Results for Plumbing."

E. Joint Sealing:
   1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
   2. Match sealant color to water-closet color.
   3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.03 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.04 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.05 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 42 13.16 – COMMERCIAL URINALS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

PART 2 PRODUCTS

2.01 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet, washout.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.
b. Kohler Co.
c. Sloan
d. TOTO USA, INC.
e. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Washout with extended shields.
d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.

e. Water Consumption: 0.5 gallons per flush.
f. Spud Size and Location: NPS 3/4, top.
g. Outlet Size and Location: NPS 2, back.
h. Color: White.

3. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.

4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture.

2.02 URINAL FLUSHOMETER VALVES – SENSOR ACTIVATED

A. Solenoid-Actuator, Diaphragm Flushometer Valves UR-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. Sloan Valve Company.
b. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
10. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
11. Consumption: 0.125 gal. per flush.
12. Minimum Inlet: NPS 3/4.
Minimum Outlet: NPS 1-1/4.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.

2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
5. Install trap-seal liquid in waterless urinals.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.03 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.04 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.05 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 42 16.13 – COMMERCIAL LAVATORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 PRODUCTS

2.01 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.
b. Kohler Co.
c. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.

c. Faucet-Hole Location: Top.

3. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.02 SOLID-BRASS, AUTOMATICALLY OPERATED LAVATORY FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets L-1: Automatic-type, battery-powered, electronic-sensor-operated, mixing, solid-brass valve.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Kohler Co.
   b. Moen Incorporated.
   c. Sloan Valve Company.

2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. General: Include below-deck mixing valve.

2.03 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key .

F. Risers:

1. NPS 3/8.
2. Chrome-plated, soft-copper flexible tube riser.

2.04 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.03 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.05 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 47 16 – PRESSURE WATER COOLERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes pressure water coolers and related components.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filter Cartridges: Provide two replacement cartridges.

PART 2 PRODUCTS

2.01 PRESSURE WATER COOLERS

A. Pressure Water Coolers DF-1: Outdoor, bi-level wall mounted standard and wheelchair accessible with bottle filling station.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Elkay Manufacturing Co.
      b. Halsey Taylor.
      c. Haws Corporation.
   2. Cabinet: All stainless steel.
   3. Bubbler: One, with adjustable stream regulator, located on cabinet deck.
   4. Bottle Filler: Laminar flow with push button activations.
   5. Control: Push bar.
   6. Drain: Grid with NPS 1-1/4 tailpiece.
   7. Supply: NPS 3/8 with shutoff valve.
   8. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
   9. Support: ASME A112.6.1M, Type I water-cooler carrier.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers to mounting frames.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings.

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.03 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture.

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.05 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 05 00 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Equipment installation requirements common to equipment sections.
2. Painting and finishing.
3. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

D. The following are industry abbreviations for plastic materials:
1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

E. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts with factory-applied end caps or plastic covers. Maintain end covers through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.5 COORDINATION

A. Arrange for chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Panels."

C. Coordination Meetings: Attend coordination meetings with the construction manager and all other trades for the purpose of coordinating the locations of all fire protection, plumbing, HVAC and electrical work for the entire project. The goal of these meetings is to avoid conflicts between trades in the field.

D. Coordination Drawings: Each fire protection, plumbing, HVAC and electrical contractor shall develop ¼" coordination floor plan drawings for all of their respective working areas that necessitate additional coordination to allow for efficient systems installation. Each coordination drawing, for all trades, shall be signed and dated by each trade indicating that each trade has fully coordinated their work

E. Conflicts Between Trades: Resolve all conflicts with other trades at no additional cost to the Owner or Architect.

F. Ceiling Heights: Maintain all ceiling heights indicated on the architectural drawings. Ceiling heights will not be lowered to accommodate installation of fire protection, plumbing, HVAC or electrical work. Install all work so that there is at least eight (8) inches clearance above the ceiling grid, in all areas, to facilitate installation of light fixtures. If installed work does not comply with the ceiling height requirements stated above, then the contractor shall remove and re-install work to comply with the stated requirements above at no additional cost to the Owner or Architect.

1.6 INTENT OF DRAWINGS AND SPECIFICATIONS

A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practices of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. The drawings depicting HVAC work are diagrammatic and show, in their approximate location, symbols representing HVAC equipment and devices. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect and/or established by manufacturer's installation drawings and details.
   1. The Contractor shall refer to shop drawings and submittal drawings for all equipment requiring HVAC connections to verify rough-in and connection locations.
   2. Unless specifically stated to the contrary, no measurement of any HVAC drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the HVAC drawings are subject to measurements of adjacent and previously completed work. All measurements shall be performed prior to the actual installation of equipment.

1.7 DRAWINGS

A. The HVAC drawings do not attempt to show the complete details of building construction which affect the HVAC installation. The Contractor shall refer to the architectural, plumbing, and electrical drawings for additional details which affect the proper installation of this work. Bring any discrepancies to the attention of the A/E for resolution. The Contractor is cautioned that diagrams showing HVAC connections and/or piping are diagrammatic only and must not be used for obtaining lineal runs of piping. Piping diagrams do not necessarily show the exact physical arrangement of the equipment.

B. The Engineer will make available to the contractor a complete set of plan sheets in AutoCAD version 2013 format. Each copy of electronic plan sheet requested will be put on disk for the cost of $200 to cover technician time and mailing costs. Any requests shall be made in writing to the Engineer with a certified check or money order payable to the Engineer. The disk(s) will be sent out within 7 days of receipt of the request and payment in full.

C. The Contractor shall be responsible for all existing field conditions, review existing field conditions prior to bid and shall take into account in bid proposal. No additional compensation will be allowed due to Contractor's failure to include all necessary work in the bid proposal.

1.8 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new and of the quality used for the purpose in good commercial practice and shall be standard product of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, catalog number, and capacity or rating on a nameplate, securely affixed on the equipment in a conspicuous place.

1.9 DAMAGE TO OTHER WORK

A. The HVAC Contractor will be held rigidly responsible for all damages to the work of his own or any other trade resulting from the execution of his work. It shall be the Contractor's responsibility to adequately protect his work at all times. All damages resulting from his operations shall be repaired or the damaged portions replaced by the party originally performing the work, (to the entire satisfaction of the Engineer), and all cost thereof shall be borne by the Contractor responsible for the damage.

1.10 COOPERATION WITH OTHER TRADES

A. This Contractor shall completely cooperate with all other trades in the matter of planning and executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay or obstruct the work of any trade.

1.11 NEGLIGENCE

A. Should the Contractor fail to provide materials, templates, etc., or other necessary information causing delay or expense to another party, he shall pay the actual amount of the damages to the party who sustained the loss.

1.12 FIELD CHANGES

A. Should any change in drawings or specifications be required to comply with local regulations and/or field conditions, the Contractor shall refer same to Architect for approval before any work which deviates from the original requirements of the drawings and specifications is started. In the event of disagreements as to the necessity of such changes, the decision of the Architect shall be final.

1.13 CUTTING AND PATCHING

A. As necessary and with approval to permit the installation of piping or any part of the work under this branch. Any cost caused by defective or ill-timed work shall be by the party responsible there for. Patching of holes, openings, etc. resulting from the work of this branch shall be furnished by this Contractor.

1.14 STANDARDS, CODES AND PERMITS

A. All work shall be installed in accordance with National, State and Local Mechanical codes, laws, ordinances and regulations. Comply with all applicable OSHA regulations.

B. All materials shall have a U.L. label where a U.L. standard and/or test exists.

C. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and working drawings required by them. Secure and pay for all permits and licenses required.

1.15 CLEAN-UP

A. This Contractor shall at all times keep the premises free from excessive accumulation of waste material or rubbish resulting from his work, including tools, scaffolding and surplus materials, and he shall leave his work broom-clean or its equivalent. In case of disputes, the Architect may order the removal of such rubbish and charge the cost to the responsible contractor as determined by the Architect. At the time of final clean-up all fixtures and equipment shall be thoroughly cleaned and left in proper condition for their intended use.

1.16 GUARANTEE

A. The Contractor shall unconditionally guarantee his work and all components thereof for a period of one year from the date of his final payment. He shall remedy any defects in workmanship and repair or replace any faulty equipment which shall appear within the guarantee period to the entire satisfaction of the Architect at no additional charge.

1.17 TEMPORARY HVAC

A. Temporary heat includes all required up to the time of substantial completion.

1.18 SUBSTITUTION AND APPROVAL OF MATERIAL, EQUIPMENT OR DESIGN

A. Such requests shall be accompanied by three copies of all necessary illustrations, cuts, drawings and descriptions of material proposed for substitution and shall fully describe all points in which it differs from the articles specified. The Engineer will retain two copies and one copy returned to the Contractor with acceptance, rejection or revisions indicated thereon.

B. The proposed substitution does not affect dimensions shown on Drawings or as specified.

C. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

D. All proposed substitutions will be subject to satisfactory performance to the specification and considered as a deduct alternate rather than as an equivalent.

E. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs, including architectural/engineering design and construction costs, involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

F. All substitution review costs shall be reimbursed to the Engineer by the contractor or their suppliers on a Time/Material bases. This cost shall be paid on approval or disproval of the substitution material, equipment or design.

1.19 SHOP DRAWINGS

A. Submit to Engineer for review, copies of manufacturer's shop drawings and/or equipment brochure depicting items in this specification.

B. Other materials at the request of the Engineer.

C. Shop drawings shall bear the Contractor's stamp indicating approval.

D. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.

E. Any shop drawing not meeting the requirements as outlined in this or any other part of this specification or drawing, requiring more than two reviews or in excess of 4 hours of total review time shall have a fee of reimbursement to the Engineer by the contractor or their suppliers. This shall be done on a Time/Material bases. This cost shall be paid on approval on disproval of the material, equipment or design.

1.20 WORKMANSHIP

A. The installation of all work shall be made so that its several component parts will function as a workable system complete with all accessories necessary for its operation, and shall be left with all equipment properly adjusted and in working order. The work shall be executed in conformity with the best-accepted standard practice of the trade so as to contribute to efficiency and appearance. It shall also be executed so that the installation will conform and adjust itself to the building structure, its equipment and its usage.

1.21 DRAWINGS OF OTHER TRADES

A. The Contractor shall consult the drawings of the work for the various other trades; field layouts of the parties performing the work of the other trades; their shop drawings, and he shall be governed accordingly in laying out his work.

1.22 FIELD MEASUREMENTS

A. The Contractor shall take all field measurements necessary for his work and shall assume the full responsibility for their accuracy.

1.23 STRUCTURAL INTERFERENCES

A. Should any structural interference prevent the installation of the fixtures, running of piping, etc., at points shown on drawings, the necessary minor deviation there from, as determined by the Architect, may be permitted. Minor changes in the position of the fixtures, equipment or piping if decided upon before any work has been done by the Contractor shall be made without additional charge.

1.24 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of the building and site, which may affect the execution of his work. No extra payment will be allowed for the failure to obtain this information. If in the opinion of the Contractor there are omissions or errors in the plans or specifications, the Contractor shall clarify these points with the Engineer before submitting his bid. In lieu of written clarification by addendum, the contractor shall resolve all conflicts in favor of the greater quantity or better quality.

PART 2 - PRODUCTS

1. NOT USED.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

3.2 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 9

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

END OF SECTION

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Pipe Hangers:
      a. B-Line Systems, Inc.
      b. Grinnell Corp.
      c. National Pipe Hanger Corp.
      d. Or approved equal.
   2. Channel Support Systems:
      a. B-Line Systems, Inc.
      b. Grinnell Corp.; Power-Strut Unit.
      c. National Pipe Hanger Corp.
      d. Unistrut Corp.
      e. Or approved Equal

2.2 MANUFACTURED UNITS

A. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
   1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

2.3 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

C. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
2. Properties: Nonstaining, noncorrosive, and nongaseous.
3. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.3 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

D. All cut ends of Unistrut style supports shall be deburred and filed smooth.

3.4 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments.

3.5 PAINTING

A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal. All hangers and supports are to be painted.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:
   1. Equipment nameplates.
   2. Equipment markers.
   3. Warning tags.

1.2 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
   1. Data:
      a. Manufacturer, product name, model number, and serial number.
      b. Capacity, operating and power characteristics, and essential data.
      c. Labels of tested compliances.
   2. Location: Accessible and visible.
   3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
   1. Terminology: Match schedules as closely as possible.
   2. Data:
      a. Name and plan number.
      b. Equipment service.
      c. Design capacity.
   1. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.2 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
   1. Size: Approximately 4 by 7 inches.
   2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
   1. Fans, blowers, primary balancing dampers, and mixing boxes.

B. Install access panel markers with screws on equipment access panels.

C. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
   1. Letter Size: Minimum 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
   3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
      a. Fans, blowers, primary balancing dampers, and mixing boxes.

D. Stenciled Equipment Marker Option: Stenciled markers may be provided instead of laminated-plastic equipment markers, at Installer's option, if lettering larger than 1 inch (25 mm) high is needed for proper identification because of distance from normal location of required identification.

3.3 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.4 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.5 CLEANING

A. Clean faces of mechanical identification devices.

END OF SECTION

SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes TAB to produce design objectives for the following:
   1. Air Systems:
      a. Constant-volume air systems.
   2. Verifying that automatic control devices are functioning properly.
   3. Reporting results of activities and procedures specified in this Section.

1.2 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Balancing Devices: All installed devices necessary to achieve proper balancing of the system such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers.

D. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

E. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

F. NC: Noise criteria.

G. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results. M:\2022\2022035 Watertown Riverside Park RR's\Specs\Div 23 Mechanical

H. RC: Room criteria.

I. Report Forms: Test data sheets for recording test data in logical order.

J. Smoke-Control System: An engineered system that uses fans to produce airflow and pressure differences across barriers to limit smoke movement.

K. Smoke-Control Zone: A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke-control system.

L. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

M. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

N. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

O. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

P. TAB: Testing, adjusting, and balancing.

Q. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

R. Test: A procedure to determine quantitative performance of systems or equipment.

S. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.3 SUBMITTALS

A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

B. Warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.
   1. Agenda Items: Include at least the following:
      a. Submittal distribution requirements.
      b. The Contract Documents examination report.
      c. TAB plan.
      d. Work schedule and Project-site access requirements.
      e. Coordination and cooperation of trades and subcontractors.
      f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
   2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".

F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.
   1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
1. Verify that balancing devices are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
2. The TAB Firm shall review the Contract Documents and the Mechanical Contractor’s shop drawings to identify any additional balancing devices that are necessary to achieve a balanced system but not shown on the drawings. Furnish and install those additional balancing devices necessary to achieve a balanced system. Coordinate with the Mechanical Contractor to properly schedule this work. Failure to coordinate installation of these devices with the Mechanical Contractor will result in absorbing all costs associated with work of other trades that is affected by modification of building components and systems. All balancing devices and installations shall comply with other Division 15 sections.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:
   1. Dampers and other controlled devices are operated by the intended controller.
   2. Dampers are in the position indicated by the controller.
   3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions.
   4. Sensors are located to sense only the intended conditions.
   5. Sequence of operation for control modes is according to the Contract Documents.
   6. Controller set points are set at indicated values.
   7. Interlocked systems are operating.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Equipment and duct access doors are securely closed.
   3. Balance dampers are open.
   4. Isolating and balancing valves are open and control valves are operational.
   5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
   6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

E. Verify that motor starters are equipped with properly sized thermal protection.

F. Check for airflow blockages.

G. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
   1. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

2. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
2. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
1. Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: Plus 5 to minus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
   1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of TAB firm.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.
   9. Signature of TAB firm who certifies the report.
   10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
   11. Summary of contents including the following:
      a. Indicated versus final performance.
      b. Notable characteristics of systems.
      c. Description of system operation sequence if it varies from the Contract Documents.
   12. Nomenclature sheets for each item of equipment.
   13. Data for terminal units, including manufacturer, type size, and fittings.
   14. Notes to explain why certain final data in the body of reports varies from indicated values.

E. Fan Test Reports: For supply, return, and exhaust fans, include the following:
   1. Fan Data:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and size.
      e. Manufacturer's serial number.
      f. Arrangement and class.
      g. Sheave make, size in inches (mm), and bore.

h. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).

2. Motor Data:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches (mm), and bore.
   f. Sheave dimensions, center-to-center, and amount of adjustments in inches (mm).
   g. Number of belts, make, and size.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Suction static pressure in inches wg (Pa).

F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
   a. System and air-handling unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F (deg C).
   d. Duct static pressure in inches wg (Pa).
   e. Duct size in inches (mm).
   f. Duct area in sq. ft. (sq. m).
   g. Indicated airflow rate in cfm (L/s).
   h. Indicated velocity in fpm (m/s).
   i. Actual airflow rate in cfm (L/s).
   j. Actual average velocity in fpm (m/s).
   k. Barometric pressure in psig (Pa).

G. Instrument Calibration Reports:
1. Report Data:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

3.10 INSPECTIONS

A. Initial Inspection:
1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure space pressure of at least 10 percent of locations.
   c. Verify that balancing devices are marked with final balance position.
   d. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 31 13 – METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500 to plus 2500 Pa). Metal ducts include the following:
   1. Rectangular ducts and fittings.
   2. Single-wall, round and flat-oval spiral-seam ducts and formed fittings.
   3. Duct liner.

B. Related Sections include the following:
   1. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Engineer. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.3 QUALITY ASSURANCE

A. NFPA Compliance:
   1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
   2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 (Z180) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 DUCT LINER (ACOUSTICAL)

A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
   1. Available Manufacturers:

a. CertainTeed Corp.; Insulation Group.
b. Johns Manville International, Inc.
c. Knauf Fiber Glass GmbH.
d. Owens Corning.

2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.

a. Thickness: 1 inch (25 mm)
d. Thermal Conductivity (k-Value): 0.26 at 75 deg F (0.037 at 24 deg C) mean temperature.
e. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
f. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
g. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

1) Tensile Strength: Indefinitely sustain a 50-lb- (23-kg-) tensile, dead-load test perpendicular to duct wall.
2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch (3 mm) into airstream.
3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.3 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.

C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

E. Solvent-Based Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.5 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
1. Manufacturers:
a. Ductmate Industries, Inc.
b. Nexus Inc.
c. Ward Industries, Inc.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Manufacturers:
a. Ductmate Industries, Inc.
b. Lockformer.
2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
3. Longitudinal Seams: Pittsburgh lock sealed with non-curing polymer sealant.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of non-braced panel area unless ducts are lined.

2.6 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).

G. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally. Refer to SMACNA requirements for ducts with velocities that exceed 2500 FPM.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   1. Fan discharges.
   2. Intervals of lined duct preceding unlined duct.
   3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

I. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
   1. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.

J. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.7 ROUND DUCT AND FITTING FABRICATION

A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.

B. Round, Longitudinal and Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

C. C. Flat-Oval, Longitudinal and Spiral Lock-Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

D. Duct Joints:
   1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
   2. Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
   3. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
   4. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.

E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
1. Supply Ducts (before Air Terminal Units): 3-inch wg (750 Pa).
2. Supply Ducts (after Air Terminal Units): 1-inch wg (250 Pa).
3. Return Ducts (Negative Pressure): 1-inch wg (250 Pa).
4. Exhaust Ducts (Negative Pressure): 1-inch wg (250 Pa)

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round and flat-oval ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

K. Electrical Equipment Spaces: Route ducts to provide necessary clearances around electrical panels

L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).

M. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Retain first paragraph below for projects in seismic areas.

3.3 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
   1. For pressure classes lower than 2-inch wg (500 Pa), seal transverse joints.

B. Seal ducts before external insulation is applied.

3.4 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

D. Install concrete inserts before placing concrete.

E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors.

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

END OF SECTION

SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Volume dampers.
2. Motorized control dampers.
3. Turning vanes.
4. Duct-mounting access doors.
5. Flexible connectors.
6. Flexible ducts.
7. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:
1. Motorized control dampers.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.3 SHEET METAL MATERIALS

A. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

B. Stainless Steel: ASTM A 480/A 480M.

C. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy 6063, temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 VOLUME DAMPERS

A. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
   1. Pressure Classes of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
   1. Aluminum Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
   2. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
   3. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.
   4. Blade Axles: Stainless steel.
   5. Bearings: Oil-impregnated bronze.
   6. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch- (25-mm-) diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
   1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 MOTORIZED CONTROL DAMPERS

A. General Description: AMCA-rated, parallel-blade design; minimum of 0.1084-inch- (2.8-mm-) thick, galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch- (1.61-mm-) thick, galvanized-steel damper blades with maximum blade width of 8 inches (203 mm).
   1. Secure blades to 1/2-inch- (13-mm-) diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.

2. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
3. Provide parallel- or opposed-blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. (51 L/s per sq. m) of damper area, at differential pressure of 4-inch wg (995 Pa) when damper is being held by torque of 50 in. x lbf (5.6 N x m); when tested according to AMCA 500D.

2.6 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- (38-mm-) wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into vane runners suitable for duct mounting.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.7 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
1. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
2. Provide number of hinges and locks as follows:
   a. Less Than 12 Inches (300 mm) Square: Secure with two sash locks.
   b. Up to 18 Inches (450 mm) Square: Two hinges and two sash locks.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch (25-mm) thickness. Include cam latches.
1. Frame: Galvanized sheet steel, with spin-in notched frame.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.8 FLEXIBLE CONNECTORS

A. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Select metal compatible with ducts.

C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

D. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).

2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

2.9 FLEXIBLE DUCTS

A. Insulated-Duct Connectors: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor barrier film.
1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20.3 m/s).
3. Temperature Range: Minus 20 to plus 210 deg F (Minus 28 to plus 99 deg C).

B. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches (75 to 450 mm) to suit duct size.

2.10 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 Control Damper Applications

A. If damper applications are not otherwise indicated, use the following:
1. Dampers Used in Mixing Airstreams: Parallel-blade.
2. Modulating or Throttling: Opposed-blade.
3. Two-position Shutoff: Parallel- or opposed-blade.
4. Outside Air: Thermally broken dampers.

3.2 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

E. Provide balancing dampers for all diffuser and equipment connections unless noted otherwise.

F. Provide additional balancing dampers that are required to achieve a balanced system but not shown on the drawings. Install balancing dampers a minimum of two duct widths from branch takeoff.

G. Provide test holes at fan inlets and outlets and elsewhere as indicated.

H. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

I. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
   1. On both sides of duct coils.
   2. Downstream from volume dampers, turning vanes, and equipment.
   3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
   4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot (15-m) spacing.
   5. On sides of ducts where adequate clearance is available.

J. Install the following sizes for duct-mounting, rectangular access doors:
   1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
   2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
   3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
   4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).

K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment."

L. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

M. For fans developing static pressures of 5-inch wg (1250 Pa) and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect flexible ducts to metal ducts with draw bands.

O. Install duct test holes where indicated and required for testing and balancing purposes.

3.3 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION

SECTION 23 34 23 – HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Centrifugal roof ventilators.

1.03 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Roof curbs.
   7. Fan speed controllers.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.06 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.07 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Carnes Company.
   2. Greenheck Fan Corporation.
   3. Loren Cook Company

2.02 INLINE EXHAUST FAN

A. Description: Direct-driven square inline fan consisting of housing, wheel, fan shaft, bearings, variable speed electronically commutated (EC) motor drive assembly, disconnect switch, and accessories.

B. Housing: Square, aluminum, venturi inlet cone.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Direct Drive Brushless ECM motor:
   1. Variable speed control for balancing.
   2. Fan and motor isolated from exhaust airstream.

E. Accessories:
   1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
   2. Motorized Dampers: Parallel-blade dampers with electric actuator; wired to close when fan stops.

2.03 CEILING MOUNTED BATHROOM EXHAUST FAN

A. Description: electronically commutated (EC) motor with three built-in, high-speed airflow settings (50, 80 or 110 cfm).

B. Occupancy sensor: Integral motion sensor energizes the fan whenever motion is detected. The fan continues to run after all motion has ceased. Adjustable time delay with settings of 1, 2, 5, 10, 20, or 30 minutes.

C. Accessories:
   1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
   2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

2.04 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.05 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300,

"Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using elastomeric mounts.

C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Division 23 "Identification for HVAC Piping and Equipment."

3.02 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26

D. Connect wiring according to Division 26.

3.03 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Verify that shipping, blocking, and bracing are removed.
   2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   3. Verify that cleaning and adjusting are complete.
   4. Adjust damper linkages for proper damper operation.
   5. Verify lubrication for bearings and other moving parts.
   6. Verify that dampers in connected ductwork systems are in fully open position.
   7. Energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
   8. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Prepare test and inspection reports.

3.04 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Lubricate bearings.

END OF SECTION

SECTION 23 37 13 – AIR INLETS AND OUTLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Ceiling and wall mounted diffusers, registers, and grilles.
2. Louvers

B. Related Sections:

1. Division 23 Section "Air Duct Accessories" for volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each product indicated, including the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

A. Grilles, registers, and diffusers shall be as manufactured by one of the following:
1. Nailor
2. Price
3. Titus

B. Types, sizes, patterns, deflections, finishes, and all accessories are scheduled on the drawings.

C. Color shall be coordinated with Architect.

D. All grilles, registers and diffusers shall be compatible with adjacent wall and ceiling systems. Confirm ceiling type with existing conditions and architectural plans and provide appropriate frame.

E. Provide 3 operating keys for each type of volume damper.

F. Provide galvanized sheet metal transitions, collars, or plenums for attaching grilles to ductwork.

G. All grilles, registers, and diffusers located in suspended lay-in ceilings shall be with compatible with the ceiling grid system as specified the architectural documents.

2.2 LOUVERS

A. Louvers shall be as manufactured by one of the following:
1. Greenheck
2. Ruskin Company.
3. American Warming and Ventilating
4. Carnes
5. Safe-Air, Dowco

B. Standard Louvers:
1. Provide 6-inch deep louver
2. K style drainable blades on 37 deg & 45 deg angles, heavy channel frame
3. Beginning point of water penetration not less than 800 FPM
4. Recessed Mullion
5. Birdscreen with ¾ inch screen.
6. Fabricate of 0.081" thick extruded 6063-T5 aluminum alloy, welded assembly.
7. Finish: “Kynar” - Organic Coating * Architectural-grade, factory-applied organic coating, 70% PVDF Resin, with chrome phosphate pretreatment. Comply with AAMA 2605-98. Final color selection by Architect.
8. Provide louvers with Extended Sill
9. Provide louvers of sizes as indicated on plans.
10. Provide louver accessories as listed on the Louver Schedules.

PART 3 - EXECUTION

3.1 GENERAL

A. Install items in accordance with manufacturer’s instructions.

3.2 GRILLES, REGISTERS AND DIFFUSERS

A. Install ceiling grilles, diffusers and registers where shown on drawings.

B. Coordinate exact location of ceiling grilles, diffusers and registers with new electrical lighting and architectural reflected ceiling plans.

C. Confirm proper orientation of all units with unit manufacturer.

3.3 LOUVERS

A. Install louvers where shown on the plans.

B. Coordinate exact size and location of louver with new architectural drawings.

C. Confirm proper orientation and opening requirements of all units with unit manufacturer.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Electrical drawings do not attempt to show complete details of building construction which affects the electrical installation. The Contractor shall refer to the complete set of project drawings and specifications for additional details, which affect the proper installation of this work.

B. The mention of any article, operation, or method requires that the Contractor shall provide same and perform each operation, in complete accordance with the conditions stated. The Contractor shall provide all material, labor, equipment and transportation as necessary to complete the project in compliance with the Contract Documents. In general, this work includes everything essential for a complete electrical system in operating order as shown on the drawings and as specified.

C. All work shall be installed in accordance with all State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with the present practices of the trade shall not relieve the Contractor from providing such additional labor and materials.

D. Before submitting his bid, each bidder shall examine the drawings relating to his work and shall become fully informed as to the extent and character of the work required and its relation to other work in the building.

E. The Contractor, in conjunction with the Owner or Architect, shall establish exact locations of all materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.

F. All materials shall be suitably stored and protected prior to installation and all work shall be protected after installation, during construction and prior to acceptance.

G. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of all equipment and apparatus required to be installed by the Contractor. All such equipment shall be removed by the Contractor upon completion of the project.

1.3 PERMITS AND LICENSES

A. The Contractor shall prepare and submit all applications and working drawings, as required, to authorities having jurisdiction over the project. All licenses and permits required shall be secured and paid for by the Contractor. The Contractor shall submit a copy of all permits secured to the Owner.

B. Provide the Owner with a written certificate that all parts of the electrical system have been inspected and final approval has been obtained from the appropriate authority having jurisdiction.

C. Provide a copy of the electrical permit to the Owner representative prior to proceeding with any work.

1.4 DEFINITIONS

A. Furnish: To supply without installing

B. Install: To set in place, connect and commission in full operation order.

C. Provide: To furnish and install.

D. Exposed: Exposed to view in any room, corridor or stairway.

E. This Contractor: The Electrical Contractor, also referred to as "The Contractor".

F. The Architect: Thrive Architects

G. The Engineer: IBC Engineering Services, Inc.

H. The Owner: The individual who the Owner selects as his project representative.

I. Code: National, State and Local Electrical codes including OSHA requirements.

J. Equivalent: Manufacturers or methods listed by name in the specifications, on the drawings or in an addendum are considered to be equivalent subject to Engineer review.

K. Substitution: Any manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

1.5 SUBMITTALS

A. Submit to Engineer for review, the manufacturer's shop drawings and/or equipment brochures in quantities determined by the associated specification section.
   1. Wiring devices.
   2. Panelboards.
   3. Enclosed Switches and Circuit Breakers.
   4. Lighting Fixtures.

5. Network Lighting Controls.

B. Shop drawings shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work and to allow for Engineer’s review.

C. Assemble material in a pdf format file, using an index at the front of each volume and tabs for each system or type of equipment

D. All data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings, and shall bear:
1. The name and location of the project.
2. The name of the Contractor.
3. The date of submittal.
4. The date of the drawings and the date of each correction and revision
5. If more than one type of lighting fixture (or other material) is on a submitted sheet, the proposed equipment shall be conspicuously checked with red pen by the Electrical Contractor.
6. Failure to do this, may result in the submittal(s) being returned to the Contractor for correction and re-submission.
7. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

E. The Contractor shall examine, stamp and sign shop drawings and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted will properly fit into the construction. The Contractor shall also review all previously completed work related to the installation of the equipment depicted to ensure that it has been properly installed.

F. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for such deviations has been granted.

G. Submit additional materials at the request of the Engineer.

H. Shop drawings shall bear the Contractor's signed stamp indicating approval or approved as noted.

I. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.

1.6 MAINTENANCE MANUALS

A. In Addition to items specified in Section 01 78 23 “Operation and Maintenance Data, the Contractor shall assemble and submit to the Architect for subsequent submission to the Owner, an electronic pdf file file of a Manual of Operation and Maintenance for each of the electrical and communications systems.

B. Each manual shall consist of a volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover all phases of operation and

maintenance of the equipment. Manuals shall accurately describe the operation, construction and adjustable features of the complete system and its component parts.

C. Assemble material in a pdf format file, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:
   1. Copies of all reviewed submittals bearing Contractor's signed stamp indicating approval or approved as noted.
   2. Manufacturer's wiring diagrams for electrically powered equipment.
   3. Records of tests performed to certify compliance with system requirements.
   4. Certificates of inspection by regulatory agencies.
   5. Parts lists for manufactured equipment.
   6. Preventive maintenance recommendations.
   7. Warranties.
   8. Additional information as indicated in the technical specification sections.

1.7 QUALITY ASSURANCE

A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

B. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply

C. All work and material shall conform with the National Electrical Code (ANSI/NFPA 70).

D. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by the Architect/Engineer, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system, shall be so labeled.

1.8 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
   1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.

D. Coordinate all work with other contractors/subcontractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

E. Coordinate electrical service connections to components furnished by utility companies.
   1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
   2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
   3. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
   4. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Coordination Meetings: Attend coordination meetings with the construction manager and all other trades for the purpose of coordinating the locations of all fire protection, plumbing, HVAC and electrical work for the entire project. The goal of these meetings is to avoid conflicts between trades in the field.

G. Coordination Drawings: Each fire protection, plumbing, HVAC and electrical contractor shall develop ¼" coordination floor plan drawings for all of their respective working areas that necessitate additional coordination to allow for efficient systems installation. Each coordination drawing, for all trades, shall be signed and dated by each trade indicating that each trade has fully coordinated their work

H. Conflicts Between Trades: Resolve all conflicts with trades at no additional cost to the Owner or Architect/Engineer.

I. Ceiling Heights: Maintain all ceiling heights indicated on the architectural drawings. Ceiling heights will not be lowered to accommodate installation of fire protection, HVAC or electrical work. Install all work so that there is at least eight (8) inches clearance above the ceiling grid, in all areas, to facilitate installation of light fixtures. If installed work does not comply with the ceiling height requirements stated above, then the contractor shall remove and re-install work to comply with the stated requirements above at no additional cost to the Owner or Architect.

J. Ceiling Grid Priority: Lighting fixture locations take priority over diffuser and sprinkler head locations.

1.9 INTENT OF DRAWINGS AND SPECIFICATIONS

A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practices of the trade shall not relieve the Contractor from providing such additional labor and materials. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect/Engineer in writing to

any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted. If in the opinion of the Contractor there are omissions or errors in the plans or specifications, the Contractor shall clarify these points in writing with the Architect/Engineer before submitting his bid. In lieu of written clarification by addendum, resolve all conflicts in favor of the greater quantity or better quality.

B. The Contractor shall furnish all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

C. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, or if a conflict exists between the Specifications and the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the Architect/Engineer's intent (as determined by the Engineer). Refer to the General Conditions of the Contract for further clarification.

D. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site with the Owner's representative and be responsible for their accuracy. Where appropriate the location shall be established in accordance with the manufacturer's installation drawings and details subject to the Architect's review.

E. All sizes as given are minimum except as noted.

F. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Authority Having Jurisdiction inspections and A/E's reviews, tests and approval from the commencement until the acceptance of the completed work.

G. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

H. Obtain equipment and accessories from single source from single manufacturer approved in each section for the following:
   1. Panelboards, Safety Switches and Enclosed Circuit Breakers.

I. The Contractor shall refer to shop drawings and submittal drawings for all equipment requiring electrical connections to verify rough-in and connection locations.

J. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. All measurements shall be performed prior to the actual installation of equipment.

K. The Electrical drawings do not attempt to show the complete details of building construction which affect the electrical installation. The Contractor shall refer to the architectural, civil, structural and mechanical drawings for additional details which affect the proper installation of this work. Bring any discrepancies to the attention of the A/E for resolution. The Contractor is cautioned that diagrams showing electrical connections and/or circuiting are diagrammatic only

and must not be used for obtaining lineal runs of wire to conduit. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

L. The Contractor shall be responsible for all existing field conditions, review existing field conditions prior to bid and shall take into account in bid proposal. No additional compensation will be allowed due to Contractor's failure to include all necessary work in the bid proposal.

1.10 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new and of the quality used for the purpose in good commercial practice, and shall be standard product of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, catalog number, and capacity or rating on a nameplate, securely affixed on the equipment in a conspicuous place.

1.11 DAMAGE TO OTHER WORK

A. The Electrical Contractor will be held rigidly responsible for all damages to the work of his own or any other trade resulting from the execution of his work. It shall be the Contractor's responsibility to adequately protect his work at all times. All damages resulting from his operations shall be repaired or the damaged portions replaced by the party originally performing the work, (to the entire satisfaction of the Architect), and all cost thereof shall be borne by the Contractor responsible for the damage.

1.12 COOPERATION WITH OTHER TRADES

A. This Contractor shall completely cooperate with all other trades in the matter of planning and executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay or obstruct the work of any trade.

1.13 NEGLIGENCE

A. Should the Contractor fail to provide materials, templates, etc., or other necessary information causing delay or expense to another party, he shall pay the actual amount of the damages to the party who sustained the loss.

1.14 FIELD CHANGES

A. Should any change in drawings or specifications be required to comply with local regulations and/or field conditions, the Contractor shall refer same to Architect/Engineer for approval before any work which deviates from the original requirements of the drawings and specifications is started. In the event of disagreements as to the necessity of such changes, the decision of the Architect/Engineer shall be final.

1.15 CUTTING AND PATCHING

A. Provide all necessary cutting and patching, and with approval, to permit the installation of conduit or any part of the work under this branch. The Contractor shall be responsible for any cost caused by defective or ill-timed work. Patching of holes, openings, etc. resulting from the work of this branch shall be provided by this Contractor.

1.16 STANDARDS, CODES AND PERMITS

A. All work and materials are to conform in every detail to applicable rules and requirements of National, State and Local electrical codes, laws, ordinances, and regulations. Comply with all applicable OSHA regulations.

B. Conform with other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

C. All Division 26 work shall be done under the direction of a currently State Certified Master Electrician.

D. All materials shall have a U.L. label where a U.L. standard and/or test exists.

E. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and working drawings required by them. Secure and pay for all permits and licenses required.

F. Abbreviations of standards organizations referenced in this and other sections are as follows:
1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. EPA Environmental Protection Agency
4. ETL Electrical Testing Laboratories, Inc.
5. IEEE Institute of Electrical and Electronics Engineers
6. IES Illuminating Engineering Society
7. ISA Instrument Society of America
8. NBS National Bureau of Standards
9. NEC National Electric Code
10. NEMA National Electrical Manufacturers Association
11. NESC National Electrical Safety Code
12. NFPA National Fire Protection Association
13. UL Underwriters Laboratories Inc.

1.17 CLEAN-UP

A. Where provided, refer to Division 01, General Requirements, Cleaning for additional requirements.

B. This Contractor shall at all times keep the premises free from excessive accumulation of waste material or rubbish resulting from his work, including tools, scaffolding and surplus materials, and he shall leave his work broom-clean or its equivalent. In case of disputes, the Architect may order the removal of such rubbish and charge the cost to the responsible contractor as

determined by the Architect/Engineer. At the time of final clean-up all fixtures and equipment shall be thoroughly cleaned and left in proper condition for their intended use.

C. The Contractor shall repair all damage to new and existing equipment resulting from his work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

1.18 TESTS

A. General: The Contractor shall provide all instrumentation, labor and conduct all tests required by the Architect. All tests shall be made before any circuit or item of equipment is permanently energized. Circuits shall be phased out and loads shall be distributed as evenly as possible on all phases. All phase conductors shall be entirely free from grounds and short circuits. All instrumentation and personnel required for testing shall be provided by the Contractor and all tests shall be conducted in the presence of the Architect or his authorized representative.

B. System Tests:
1. Service and building ground tests.
2. Secondary feeders shall have an insulation resistance test utilizing a megger applying a test potential of 500 volts DC minimum.
3. Establish secondary phase to ground voltages.
4. Establish proper phase relationship and motor rotation.

The following tests are required under normal load condition:

5. Record secondary phase to phase and phase to ground voltages and phase currents at all major equipment, apparatus, and on all secondary feeders. Voltage readings shall be taken at line side terminals of distribution centers and panelboards.
6. Confirm proper phase relationship and motor rotation.
7. Confirm load balance at distribution centers and panels. Rebalance load if necessary such that the minimum unbalance between phases shall not exceed 7-1/2%.
8. Reset transformer taps if necessary to deliver nominal rated voltage. Identify final tap settings on transformers nameplates.
9. Confirm operation of all electrically operated apparatus, such as circuit breakers, etc., by exercising same under load.
10. Record all settings and calibrations of circuit breakers, meters, timing devices, etc.

C. Records: All test data obtained by the Contractor or manufacturer/supplier shall be recorded and filed with the maintenance manual as part of permanent job records. Test data shall include identification of instruments employed, (field test only) condition of test (time, date, weather, etc.), parameters of test, personnel conducting test, and any pertinent information or conditions noted during the test.

1.19 DRAWINGS OF OTHER TRADES

A. The Contractor shall consult the drawings of the work for the various other trades; field layouts of the parties performing the work of the other trades; their shop drawings, and he shall be governed accordingly in laying out his work.

B. Specifically examine shop drawings of other trades to confirm voltage, current characteristics, and other wiring requirements for utilization equipment. Bring any discrepancies to the attention of the A/E.

1.20 FIELD MEASUREMENTS

A. The Contractor shall take all field measurements necessary for his work and shall assume the full responsibility for their accuracy.

B. Should any structural interferences prevent the installation of the outlets, running of conduits, etc., at points shown on drawings, the necessary minor deviations therefrom, as determined by the Architect, may be permitted. Minor changes in the position of the outlets or equipment if decided upon before any work has been done by the Contractor shall be made without additional charge.

1.21 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

A. Before submitting a bid, the Contractor shall familiarize himself with all features of the building and site which may affect the execution of his work. No extra payment will be allowed for the failure to obtain this information. As soon as possible but no later than ten (10) days before bid opening, the Contractor shall call the attention of the Architect/Engineer in writing of any materials or apparatus the Contractor believes to be inadequate and/or any necessary items of work omitted. If the Contractor believes there are inadequacies in the specifications or drawings, where clarifications are necessary to complete the project in accordance with the Contract Documents, the Contractor shall clarify these points with the Architect/Engineer before submitting his bid. In lieu of written clarification by addendum, resolve all conflicts in favor of the greater quantity or better quality.

1.22 GUARANTEE

A. The Contractor shall unconditionally guarantee his work and all components thereof, excluding lamps, for a period of one year from the date of his final payment unless indicated otherwise other sections of Divisions 26. He shall remedy any defects in workmanship and repair or replace any faulty equipment which shall appear within the guarantee period to the entire satisfaction of the Owner/Architect at no additional charge.

1.23 SUBSTITUTION AND APPROVAL OF MATERIAL, EQUIPMENT OR DESIGN

A. Unless indicated otherwise in Division 1, provide the following material for any substitution. If there are conflicts between these requirements and Division 1, then Division 1 supersedes these requirements.

B. Such requests shall be accompanied by a pdf format file submittal of all necessary illustrations, cuts, drawings and descriptions of material proposed for substitution and shall fully describe all points in which it differs from the articles specified. The Engineer will inform the Contractor with acceptance, rejection or revisions indicated in the returned submittal.

C. The proposed substitution does not affect dimensions shown on Drawings or as specified.

D. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

E. All proposed substitutions will be subject to satisfactory performance to the specification and considered as a deduct alternate rather than as an equivalent.

F. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs, including architectural/engineering design and construction costs, involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the performance from the system into which these items are placed.

G. All substitution review costs shall be reimburse to the Engineer by the contractor or their suppliers on a Time/Material bases. This cost shall be paid on approval on disproval of the substitution material, equipment or design.

1.24 WORKMANSHIP

A. The installation of all work shall be made so that its several component parts will function as a workable system complete with all accessories necessary for its operation, and shall be left with all equipment properly adjusted and in working order. The work shall be executed in conformity with the best-accepted standard practice of the trade so as to contribute to efficiency and appearance. It shall also be executed so that the installation will conform and adjust itself to the building structure, its equipment and its usage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Unless otherwise indicated in the drawings, mount electrical equipment above finished floor to center line of device as follow:
   1. Wiring Devices
      a. Switches and Switch/Receptacle Combinations: 46 inches above finished floor.
      b. Receptacles:
         1) Standard: 18 inches above finished floor.
         2) Above countertops: 4 inches mounted vertically above backsplash or if directed otherwise, 6 inches mounted horizontally above backsplash.
      c. Telecommunication Outlets
         1) Standard: 18 inches above finished floor.
         2) Above countertops: 4 inches mounted vertically above backsplash or if directed otherwise, 6 inches mounted horizontally above backsplash.
      d. Low Voltage Equipment
         1) Safety Switches: 46 inches above finished floor.
         2) Panel boards: 72 inches above finished floor to top of enclosure.
         3) Motor Controllers: 60 inches above finished floor to top of enclosure.

3.2 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.3 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 07 Section “Through-Penetration Firestop Systems.”

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete." Top of exterior concrete base shall be 6 inches above finish grade, top of interior concrete bases or housekeeping pads shall be 2 inches above finish floor.

3.5 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.6 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements per associated paint specifications by Architect or Owner.
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.7 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
   1. Raceways.
   2. Building wire and connectors.
   3. Supporting devices for electrical components.
   4. Electrical identification.
   5. Electricity-metering components.
   6. Concrete bases.
   7. Cutting and patching for electrical construction.
   8. Touchup painting.

3.8 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.

1.2 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

VFD: Variable-frequency controller

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Encore Wire Corporation
2. Southwire Company
3. Colonial
4. Or Approved Equal

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type NM: Comply with UL 83 and UL 719.
2. Type USE-2: Comply with UL 854.
3. Type THHN/THWN-2: Comply with UL 83.
4. Type THW: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
5. Type UF: Comply with UL 83 and UL 493.
6. Type XHHW-2: Comply with UL 44.
7. Type SO

2.3 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.
4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Ground Conductor: Insulated.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.

2. Type XHHW-2: Comply with UL 44.

G. Armor: Steel, interlocked.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Rated for conductor material use.
2. Type: One hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid or Stranded for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. VFD Output Circuits Cable: Extra-flexible stranded for all sizes.

D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

F. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
   1. Type MC for alternate deduct as approved by engineer.

H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Terminate stranded conductors with spades, rings or pin connectors for conductors No. 10 AWG or smaller.

D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) (300 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

   a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
   b. Test bolted connections for high resistance using one of the following:

      1) A low-resistance ohmmeter.
      2) Calibrated torque wrench.
      3) Thermographic survey.

   c. Inspect compression-applied connectors for correct cable match and indentation.
   d. Inspect for correct identification.
   e. Inspect cable jacket and condition.
   f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
   g. Continuity test on each conductor and cable.
   h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Ground rods.
   2. Ground rings.
   3. Grounding arrangements and connections for separately derived systems.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control reports.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified, include the following:
      a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
         1) Ground rods.
         2) Ground rings.
         3) Grounding arrangements and connections for separately derived systems.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 Comply with UL 467 for grounding and bonding materials and equipment.MANUFACTURERS

A. Manufactures: Subject to compliance with requirements, provide products by one of the following:
   1. Grounding Conductors, Cables, Connectors and Rods:
      a. Apache Grounding/Erico Inc.
      b. Boggs, Inc.
      c. Chance/Hubbell.
      d. Copperweld Corp.
      e. Dossert Corp.
      f. Erico Inc.; Electrical Products Group.
      g. Framatome Connectors/Burndy Electrical.
      h. Galvan Industries, Inc.
      i. Harger Lightning Protection, Inc.
      j. Hastings Fiber Glass Products, Inc.
      k. Heary Brothers Lightning Protection Co.
      l. Ideal Industries, Inc.
      m. ILSCO.
      n. Kearney/Cooper Power Systems.
      o. Korns: C. C. Korns Co.; Division of Robroy Industries.
      p. Lightning Master Corp.
      q. Lyncole XIT Grounding.
      r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
      s. Raco, Inc.; Division of Hubbell.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 6 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart, unless identified otherwise. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.

E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.

H. Conduit Hubs: Mechanical type, terminal with threaded hub.

I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.

K. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

L. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

M. Straps: Solid copper, copper lugs. Rated for 600 A.

N. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal two-piece clamp.

O. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

P. Water Pipe Clamps:

1. Mechanical type, two pieces with stainless-steel bolts.

a. Material: Die-cast zinc alloy.
b. Listed for direct burial.

2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m) (16 by 2400 mm).

B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except as otherwise indicated.
3. Connections to Ground Rods: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. Use exothermic welds for all below-grade connections.
3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

G. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.

1. Install copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

H. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: **10** ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: **5** ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: **3** ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: **3** ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.2 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M and as required by NFPA 70.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a) Allied Tube & Conduit.
b) Cooper B-Line, Inc.; a division of Eaton.
c) ERICO International Corporation.
d) Thomas & Betts Corporation.
e) Unistrut; Atkore International, Ltd.
f) Wesanco, Inc.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 for steel shapes and plates.

C. Design and engineering of support assemblies by contractors must be verified by structural engineer or qualified personnel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.
4. NECA 105.
5. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 3/8 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

G. Plastic cable ties (zip ties) are not allowed, except for securing conductors within panel and equipment cabinet enclosures.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC, may be supported by openings through structure members, according to NFPA 70.

C. Raceway and cables shall not be supported from other raceway.

D. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts] and, or Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

F. Drill holes for expansion anchors in concrete at locations and to depths that avoid the reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Division 09 for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground branch circuit cabling.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. GRC: Galvanized rigid steel conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. PVC: Polyvinyl chloride.

G. RNC: Rigid non-metallic conduit.

1.3 ACTION SUBMITTALS

A. Product Data: For wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; Atkor International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; Emerson Electric Co.
6. Republic Conduit.
7. Southwire Company.
8. Thomas & Betts; a Member of the ABB Group.
9. Western Tube and Conduit Corporation.
10. Wheatland Tube Company; a division of John Maneely Company.

B. Metal Conduit:

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. IMC: Comply with ANSI C80.6 and UL 1242.
4. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040 inch (1 mm), minimum.
5. EMT: Comply with ANSI C80.3 and UL 797.
6. FMC: Comply with UL 1; zinc-coated steel.
7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

C. Metal Fittings:
1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
    a. Material: Steel.
    b. Type: Setscrew or compression.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

D. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. CANTEX Inc.
4. CertainTeed Corp.
5. Lamson & Sessions; Carlon Electrical Products.
6. RACO; a Hubbell company.
7. Thomas & Betts; a Member of the ABB Group.

B. Nonmetallic Conduit:

1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. ENT: Comply with NEMA TC 13 and UL 1653.
3. RNC: Type EPC-40/80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
4. LFNC: Comply with UL 1660.
5. Rigid HDPE: Comply with UL 651A.
6. Continuous HDPE: Comply with UL 651A.
7. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
8. RTRC: Comply with UL 2515A and NEMA TC 14.

C. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Square D; a brand of Schneider Electric.
4. Wiegmann; Hubbell Inc.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. EGS/Appleton Electric.
3. Hoffman; a Pentair company.
4. Hubbell Incorporated; Killark Division.
5. Mono-Systems, Inc.
6. O-Z/Gedney; Emerson Electrical Co.
7. RACO; a Hubbell Company.
8. Spring City Electrical Manufacturing Company.
9. Thomas & Betts; a Member of the ABB Group.
10. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Floor Boxes:

1. Material: Cast metal plastic
2. Type: Fully adjustable to be flushed with finished floor
3. Shape: Rectangular or Round
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment and hold weight of luminaire(23 kg). Outlet boxes designed for attachment of luminaires and hold weight (23 kg)of luminaire.
1. Luminaire weighing more than 50lbs shall not be supported by outlet boxes.

H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan(32 kg).

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Paddle Fan weighting more than 70lbs shall not be supported by outlet boxes.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions:
1. Single-gang box: 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm square by 60 mm deep).
2. Double-gang box: 4 inches square by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).
3. Three-gang box: 4-1/2 inches by 8-5/8 inches by 2-1/2 inches deep.

M. Gangable boxes are prohibited.

N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated. Rated for use in installed environment or otherwise noted.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:

1. NEMA 250, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND BRANCH CIRCUIT WIRING.

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
   1. Standard: Comply with SCTE 77. Unit, when buried, shall be designed to support AASHTO H10 loading.
   2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   5. Cover Legend: Molded lettering, "ELECTRIC." or COMMUNICATIONS”
   6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: GRC.
   3. Underground Conduit: RNC, Type EPC-40-PVCdirect buried or concrete encased.
   4. Underground Conduit under paved areas: Type EPC-80-PVC direct buried
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R, unless otherwise indicated.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed and Subject to Severe Physical Damage: GRC.
   3. Ceilings and Interior Walls and Partitions: EMT.
   4. Connection to Vibrating Equipment (Including Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   5. Damp or Wet Locations: GRC.
   6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch (16-mm) (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm)of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Not acceptable.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located

where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors, or as otherwise required by NFPA 70.
    1. Use LFMC in damp or wet locations subject to severe physical damage.
    2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to **center** of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 .
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Division 07 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

   a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
   b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   2. Pressure Plates: Carbon steel.
   3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed**.**
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 6 inches finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways, Direct Buried and Aerial Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

B. Color-Coding for Phase-and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded conductors.

1. Color shall be factory applied for #8AWG or smaller, or where applicable.
2. Colors for 208/120-V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d.
3. Color for Neutral: White for 240V or less.
4. Color for Equipment Grounds: Green

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:
1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

E. Equipment Identification Labels:

1. Black letters on a white field for non-emergency equipment

2. 3 lines
    a. Line 1: Equipment Name
    b. Line 2: Voltage System and Wires
    c. Line 3: Fed From

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Minimum Nominal Size:
    a. 1-1/2 by 6 inches (37 by 150 mm)for raceway and conductors.
    b. 3-1/2 by 5 inches (76 by 127 mm)for equipment.
    c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and is 12 inches (300 mm) wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:
1. Tape:
    a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE"
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE"

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch (0.58 mm) thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.7 SIGNS

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
c. Engraved legend with black letters on white face for non-emergency devices, white letters on red background for emergency devices.
d. Punched or drilled for stainless steel mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
f. Self Adhesive equipment labels are not allowed.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).

2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings,

manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

J. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

K. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

L. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

N. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

O. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

P. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

Q. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

R. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

S. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

T. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 12 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

U. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using plenum-rated cable ties.

V. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with stainless steel mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

W. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.

G. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

H. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

I. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

J. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.

M. Arc Flash Warning Labeling: Self-adhesive labels.

N. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign **(100 mm)**.
3. Equipment to Be Labeled:
   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of an engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Motor-control centers.
   e. Enclosed switches.
   f. Enclosed controllers.
   g. Contactors.
   h. Remote-controlled switches, dimmer modules, and control devices.
   i.

END OF SECTION 26 05 53

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. AFCI: Arc-fault circuit interrupter.

D. GFEP: Ground-fault equipment protection.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating to prevent condensation.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cutler Hammer; Eaton

B. General Electric by ABB

C. Siemens

D. Square D; Schneider Electric

E. Sole source with other distribution equipment

2.2 PANELBOARDS COMMON REQUIREMENTS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.
   a. Wet or Damp Indoor Locations: NEMA 250, Type 4.
2. Height: 72 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:
   a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes:
      1) Panelboards: Galvanized
6. Same Height Boxes for Double Tub panelboards.

F. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

H. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: Ten percent.

I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, or Short Circuit Study if provided, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, or Short Circuit Study if provided, but not less than 14,000 A rms symmetrical.

2.3 PERFORMANCE REQUIREMENTS

A. Integral Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2 with 80kA per mode or as shown on drawings.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: As shown on drawings

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.
d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
e. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
g. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Equipment Mounting:
   1. Attach panelboard to the vertical finished or structural surface behind the panelboard.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount panelboard cabinet plumb and rigid without distortion of box.

F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

I. Install filler plates in unused spaces.

J. Stub four 1-inch (25 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (25 mm) empty conduits into raised floor space or below slab not on grade.

K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Inspect components, assemblies, and equipment installations, including connections per manufacturer’s recommendations.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated in the coordination study when provided.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.

2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Straight-blade convenience receptacles.
2. GFCI receptacles.
3. Toggle switches.
4. Wall plates.

1.3 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
3. Leviton: Leviton Mfg. Company, Inc.
4. Pass & Seymour: Pass& Seymour/Legrand.

B. AFCI: Arc-fault circuit interrupter.

C. BAS: Building automation system.

D. EMI: Electromagnetic interference.

E. GFCI: Ground-fault circuit interrupter.

F. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

G. RFI: Radio-frequency interference.

H. SPD: Surge protective device.

I. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

B. Manufacturers: Subject to compliance with the requirements, provide products by one of the following:

1. Eaton (Arrow Hart)
2. Hubbell Incorporated; Wiring Devices-Kellems
3. Leviton Manufacturing Company, Inc.
4. Pass & Seymour/Legrand

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

D. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.4 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
4. Weather Resistant type for exterior use.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

C. Pilot-Light Switches: 120/277 V, 20 A.
1. Description: Single pole, with LED-lighted handle, illuminated when switch is off.

D. Key-Operated Switches: 120/277 V, 20 A.
1. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, while-in-use weather-resistant, die-cast aluminum with lockable cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White or as otherwise selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit in PDF format.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified, include the following:

1. Ambient temperature adjustment information.

2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in PDF format.
4. Coordination charts and tables and related data.

1.5 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C) , apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Edison; a brand of Bussmann by Eaton

B. Littlefuse, Inc.

C. Mersen USA

D. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 250 or 600-V, zero- to 600-A rating, 200 kAIC.
2. Type RK-5: 250 or 600-V, zero- to 600-A rating, 200 kAIC.
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC.
5. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC.
7. Type T: 600-V, zero- to 1200-A] rating, 200 kAIC.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
1. Motor Branch Circuits: Class RK1 or Class RK5, time delay.
2. Other Branch Circuits: Class RK1 or Class RK5.
3. Control Transformer Circuits: Class CC, time delay, control transformer duty.
4. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

D. GFCI: Ground-fault circuit interrupter.

E. RMS: Root mean square.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer from the same manufacturer as the panelboards.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

A. Type HD, Heavy Duty:

1. Provide switch with characteristics as indicated on drawings.
2. 240-V ac.
3. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate required fuses.
4. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single or Three Pole, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Mechanical type, suitable for number, size, and conductor material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.3 INSTALLATION

A. Coordinate layout and installation of switches and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that the unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the two following methods:

1) Use a low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published.

a) Bolt-torque levels shall be in accordance with manufacturer's published data.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. Investigate values of insulation resistance less than those recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test according to manufacturer’s recommendations**.**

B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures with lamps and ballasts.
2. Lighting fixtures mounted on exterior building surfaces.
3. Emergency lighting units.
4. Accessories, including fixture dimmers and occupancy sensors.

1.2 DEFINITIONS

A. CRI: Color rendering index.

B. CCT: Correlated color temperature.

C. CU: Coefficient of utilization.

D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

E. LPW: Lumens per watt, system efficacy.

F. RCR: Room cavity ratio.

G. LED: Light emitting diode.

H. L_{70}: Lumen depreciation to 70% of initial lumen output.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of fixture, including dimensions and verification of indicated parameters.
2. Emergency lighting unit battery and charger.
3. Photometric data.
4. Complete fixture catalog number designation.
5. Manufacturer name

6. LED:
    a. CCT, CRI
    b. Delivered lumen output
    c. Driver
        1) Voltage
        2) Drive current
        3) Provide documentation illustrating compatibility to the submitted control system.
    d. LPW

B. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Closeout Procedures," include the following:

1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.

E. Warranties: Special warranties specified in this Section.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
2. Replaceable LED lamp modules: One for every 100 for each type installed. Furnish at least one of each type.
3. Drivers, Power Supplies, DMX Decoder: One for every 100 of each type installed. Furnish at least one of each type.

1.5 QUALITY ASSURANCE [retain a or b if indepentent testing agency is used]

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

B. Coordinate luminaire ballast and driver selection with submitted control system.

C. Coordinate luminaire with submitted ceiling system for appropriate mounting accessory(s).

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIXTURES AND COMPONENTS, GENERAL

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

F. Diffusers, Covers, and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
      a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is scheduled.
      b. UV stabilized.
   2. Glass: Annealed crystal glass, unless otherwise indicated.

G. Metal Finishes:
1. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range and if they can be and are assembled or installed to minimize contrast.
2. Paint after fabrication where option is available from manufacturer.

H. For all luminaires provide the product specified in the lighting schedule or an equal product that meets the performance requirements listed within the specifications. Equals are subject to design team's acceptance.
1. Equal shall have the same aesthetic qualities and appearance as the specified luminaire including, but not limited to, shape, dimensions, mounting, and finish.
2. Lumen data for all LED luminaires
   a. Lumen data must be per IES LM-79 & 80.
   b. Lumen data must be based on equal drive current to specified fixture.
   c. Lumen data must be calculated at the same CCT as specified luminaire.
3. Provide photometric calculations for equals for typical areas upon request.
   a. Include in provided calculations LLF utilized.
   b. LLF for LED: .85 LLF.
   c.
4. Equals shall have the same electrical components as the specified luminaire including but not limited to the following:
   a. Lamping including number, type and layout within the fixture (staggered or not).
   b. Distribution.
   c. Voltage.
   d. Driver shall be of the same type as listed in the schedule including the drive current. If a different control system is selected the driver must have the same drive current and be able to work with the selected system while having the same functionality as the specified luminaires' driver.

2.2 EMERGENCY LIGHTING UNITS

A. General: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.
5. Contractor shall provide ten percent of total emergency lighting units to be installed at the direction of the A/E or authority having jurisdiction.
6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.3 LED Luminaires

A. Maintain color consistency and light intensity across multiple fixtures of the same designation and those with the same family.

B. Design luminaires with heat sinking adequate such that the junction temperature of the LED's is maintained to meet the rated life as published by the LED manufacturer.

2.4 LED LIGHT SOURCES (LED PACKAGES, ARRAYS, OR MODULES)

A. Minimum CRI of 80 unless otherwise indicated.

B. Bin LED's so that all luminaires of the same type have closely-matched color and lumen output characteristics so that they shall be within 3 Mc Adams ellipse steps.

C. Efficacy: 50 Lumens per watt unless otherwise indicated.

D. L_{70}: 50,000 hours minimum.

E. CCT: 4000-4100 K unless otherwise indicated.

2.5 led pOWER SUPPLY

A. Performance Requirements:
1. Operate LED's within the current limit specifications for the LED manufacturer.
2. Operate at 60Hz input source and have input power factor above 90% and a minimum efficiency or 70% at full rated load of the driver.
3. Provide short circuit and overload protection.

B. Regulatory Requirements:
1. Contain no PCB's (polychlorinated biphenyl)
2. Comply with IEEE C.62.41-1991, Class A operation.
3. Be UL1310/8750 recognized when used in conjunction with a UL listed luminaire.

2.6 FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage (2.68 mm).

E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

F. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.

G. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.7 FINISHES

A. Fixtures: Manufacturers' standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

2.8 SOURCE QUALITY CONTROL

A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with driver and lamps; certify results for electrical ratings and photometric data.

B. Factory test fixtures with driver and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

C. Supports:
1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

D. Flush-Mounted Luminaire Support:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

E. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls, to a minimum 20 gauge backing plate attached to wall structural members or using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

F. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Burn in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

D. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

F. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up One visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
   2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   3. Adjust the aim of luminaires in the presence of the Architect or owner’s representative.

END OF SECTION 26 51 00

RIVERSIDE PARK RESTROOM - NEW CONSTRUCTION

600 LABAREE ST. | WATERTOWN, WI 53098

SHEET INDEX

BUILDING CODE SUMMARY

BASED ON THE	WISCONSIN COMMERCIAL BUILDING CODE (2015 INTERNATIONAL BUILDING CODE w/ WI AMENDMENTS) 2015 INTERNATIONAL EXISTING BUILDING CODE 2009 ANSI A117.1 ACCESSIBILITY CODE ALL OTHER CODES AND ORDINANCES AS REFERENCED BY THE ABOVE CODES
BUILDING AREA	TOTAL AREA FIRST FLOOR: 2,014 GROSS SF
FIRE ALARM:	NOT REQUIRED
OCCUPANCY	U - UTILITY
OCCUPANCY SEPARATION	NONE
CONSTRUCTION TYPE	V-B
SPRINKLER SYSTEM	NOT REQUIRED
FLAME SPREAD & SMOKE INDEX	NO RESTRICTIONS
CODE EXCEPTION	NONE

GENERAL NOTES

1. CONSTRUCTION IS TO BE IN COMPLIANCE WITH ALL GOVERNING CODES, ORDINANCES & STANDARDS. THE CONTRACTOR(S) SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, & SUPERVISING ALL SAFETY PRECAUTIONS & PROGRAMS IN CONNECTION WITH THE PERFORMANCE OF THIS PROJECT.
2. ARCHITECT/DESIGNER SHALL NOT BE RESPONSIBLE FOR ANY COST, SCHEDULE OR CONSTRUCTION ISSUES ARISING DUE GC/OWNERS FAILURE TO DISTRIBUTE ALL DOCS. SUBCONTRACTORS & SUPPLIERS SHOULD ENDEAVOR TO REVIEW A COMPLETE SET OF DOCS BEFORE BIDDING, FABRICATING & INSTALL.
3. GC, SUBCONTRACTORS, MATERIAL SUPPLIERS, OWNER, ETC. MUST NOTIFY ARCHITECT OF ANY ERRORS, OMISSIONS, OR DEFECTS IN THE CONSTRUCTION DOCUMENTS PRIOR TO BIDDING, FABRICATING OR INSTALLING WORK.
4. SITE DIMENSIONS ARE TO BE FIELD VERIFIED AND ADJUSTED ACCORDINGLY. THE ARCHITECT/DESIGNER SHALL BE NOTIFIED OF ANY VARIANCES BEFORE CONTRACTOR BEGINS OR PROCEEDS WORK.
5. MECH, ELEC, PLUMB & FIRE PROTECTION ARE TO BE DESIGN BUILT, COMPLYING WITH ALL GOVERNING CODES, ORDINANCES & STANDARDS, WHICH WILL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR; THE ARCHITECT ASSUMES NO LIABILITY.
6. ALL MECH, ELEC, PLUMB & FIRE PROTECTION SYSTEMS/EQUIP. SHALL BE MAINTAINED ACCORDING TO MANUFACTURER'S STANDARDS. BLDG. OWNER SHALL ASSUME FULL RESPONSIBILITY FOR MAINTANANCE/OPPERATION UPON OCCUPANCY.
7. THE INSTALLATION AND EXECUTION OF ALL MATERIALS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S STANDARDS AND SPECIFICATIONS. ALL MEANS & METHODS OF CONSTRUCTION TO BE THE SOLE RESPONSIBILITY OF THE GC.
8. PORTABLE FIRE EXTINGUISHERS SHALL BE PROVIDED IN OCCUPANCIES AND LOCATIONS AS REQUIRED BY THE INTERNATIONAL FIRE CODE. INSTALLATION LOCATIONS SHALL HAVE A MAXIMUM TRAVEL DISTANCE OF 75' TO ANY EXTINGUISHER. EXTINGUISHERS SHALL BE LOCATED IN CONSPICUOUS LOCATIONS WERE THEY WILL BE READILY ACCESSIBLE AND IMMEDIATELY AVAILABLE FOR USE, TYPICALLY ALONG PATHS OF TRAVEL. EXTINGUISHERS SHALL NOT BE OBSTRUCTED FROM VIEW. IF VISUAL OBSTRUCTION CAN NOT BE AVOIDED ANOTHER MEANS SHALL BE PROVIDED TO INDICATE THE EXTINGUISHER LOCATIONS. EXTINGUISHERS NOT EXCEEDING 40" SHALL BE INSTALLED SO THAT ITS TOP IS NOT MORE THAT 5'-0" ABOVE THE FLOOR, EXTINGUISHERS EXCEEDING 40" SHALL BE INSTALLED SO THAT ITS TOP IS NOT MORE THAN 3'-6" ABOVE THE FLOOR. THE CLEARANCE BETWEEN THE FLOOR AND BOTTOM OF HAND HELD UNITS SHALL NOT BE LESS THAN 4". VERIFY EXTINGUISHER LOCATIONS W/ LOCAL FIRE DEPT. & OWNER PRIOR TO INSTALLATION.
9. ALL CONCRETE FLAT WORK MUST BE WET CURED PER ACI REQUIREMENTS AND/OR CURED USING A CURING COMPOUND. REFER TO STRUCTURAL NOTES FOR CURING COMPOUND SPECS. CONTRACTOR IS RESPONSIBLE FOR APPLYING CURING COMPOUNDS PER THE MANUFACTURER'S REQUIREMENTS.

PROJECT CONTACT INFO

ARCHITECT:
THRIVE ARCHITECTS
259 SOUTH STREET, SUITE A
WAUKESHA, WI 53186
P: 833-380-6180
PROJECT MANAGER: DAVID RASCHKA

ATTN: JEREMY BARTLETT,
ARCHITECT OF RECORD

CIVIL ENGINEER:
JSD INC.
W238 N1610 BUSSE RD., SUITE 100
WAUKESHA, WI 53188
P: 262-513-0666
ATTN: KEVIN BYRNE, PLA & LEED AP BD+C

STRUCTURAL ENGINEER:
CORE 4 ENGINEERING, INC.
12308 CORPORATE PKWY., SUITE 450
MEQUON, WI 53092
P: 262-307-9988
ATTN: TOMMY TOLGAHAN UNAL

MECHANICAL ENGINEER:
IBC ENGINEERING SERVICES, INC.
N8W22195 JOHNSON DR.
WAUKESHA, WI 53186
P: 262-549-1190
ATTN: COLLEEN HOFFMANN, PE

ELECTRICAL ENGINEER:
IBC ENGINEERING SERVICES, INC.
N8W22195 JOHNSON DR.
WAUKESHA, WI 53186
P: 262-549-1190
ATTN: DENNIS HESS, PE

PLUMBING ENGINEER:
IBC ENGINEERING SERVICES, INC.
N8W22195 JOHNSON DR.
WAUKESHA, WI 53186
P: 262-549-1190
ATTN: COLLEEN HOFFMANN, PE

OWNER:
CITY OF WATERTOWN
106 JONES ST., P.O. BOX 477
WATERTOWN, WI 53094
P: 920-262-4000

TYPICAL ABBREVIATIONS

ABV: Above
ACOUS: Acoustical
ADDL: Additional
ADH: Adhesive
ADJ: Adjustable
AFF: Above Finish Floor
AGG: Aggregate
AHJ: Authority Having Jurisdiction
A/C: Air Conditioning
ALT: Alternate
ALUM: Aluminum
ANC: Anchor, Anchorage
AB: Anchor Bolt
ANOD: Anodized
APX: Approximate
APT: Apartment
ARCH: Architect (architectural)
ASPH: Asphalt
AUTO: Automatic
AVE: Avenue
AVR: Average
AWN: Awning

BSMT: Basement
BM: Beam
BVL: Beveled
BITUM: Bituminous
BLK: Block
BLKG: Blocking
BLW: Below
BLDV: Boulevard
BTW: Between
BD: Board
BOT: Bottom
BLDG: Building
BUR: Built Up Roofing

B/O: By Others
BO: Bottom Of
BR: Bedroom

CAB: Cabinet
CALC: Calculation
CD: Cabinet Door
CG: Corner Guard
CIP: Cast-In-Place (Concrete)
CL: Centerline
CO: Clean Out
CONTR: Contract (or)
COORD: Coordinate
CRPT: Carpet
CIP: cast-in-place
CLK: Caulking
CAS: Casement
CB: Catch Basin
CLG: Ceiling
CT: Ceramic Tile
CIR: Circle
CLR: Clear
COL: Column
CONC: Concrete
CMU: Concrete Masonry Unit
CONST: CONSTruction
CONT: Continuous
CJT: Control Joint
CORR: Corrugated
CUFT: Cubic Foot
CUYD: Cubic Yard

DP: Dampproofing
DTL: Detail
DIA: Diameter
DIM: Dimension

DW: Dishwasher
DIV: Division
DR: Door
DH: Double Hung
DS: Downspout
DRWR: Drawer
DT: Drain Tile
DWG: Drawing
D: Nail Size

EW: Each Way
E: East
EL: Elevation
ELEV: Elevation
EQ: Equal
EQP: Equipment
EXCV: Excavate
EXH: Exhaust
EXIST: Existing
EXT: Exterior

FOC: Face of Concrete
FOF: Face of Finish
FOM: Face of Masonry
FOS: Face of Studs
FOW: Face of Wall
FBD: Fiberboard
FCB: Fiber Cement Board
FGL: Fiberglass
FIN: Finish
FFE: Finished Floor Elevation
FA: Fire Alarm
FE: Fire Extinguisher
FPL: Fireplace
FLSH: Flashing
FLR: Floor
FLOR: Fluorescent
FT: Foot, Feet

FTG: Footing
FND: Foundation
FRM: Fram(d), (ing)
FBO: Furnished by Others
FUR: Furred

GA: Gage, Gauge
GAL: Gallon
GL: Glass, Glazing
GI: Galvanized Iron
GLBK: Glass Block
GLB: Glue Laminated Beam
GT: Grout
GRD: Grade, Grading
GWB: Gypsum Wall Board

HWD: Hardware
HDR: Header
HTG: Heating
HVAC: Heating, Ventilation-Air Conditioning
HT: Height
HC: Hollow Core
HOR: Horizontal
HB: Hose Bib

IN: Inch
INCL: Include
ID: Inside Diameter
INS: Insulate
INT: Interior
INV: Invert

JNT: Joint
JST: Joist

KD: Kiln Dried
KIT: Kitchen

LB: Pound
LAM: Laminate(d)
LAV: Lavatory
LH: Left Hand
L: Length
LOA: Length Overall
LT: Light
LF: Lineal Feet
LL: Live Load
LVL: Laminated Veneer Lumber
LVR: Louver

MFR: Manufacturer
MO: Masonry Opening
MAX: Maximum
MAS: Masonry
MECH: Mechanic(al)
MC: Medicine Cabinet
MED: Medium
MDF: Medium Density Fiberboard
MDO: Medium Density Overlay
MBR: Member
MMB: Membrane
MTL: Metal
MWK: Millwork
MIN: Minimum
MIR: Mirror
MISC: Miscellaneous
MOD: Module
MLD: Moulding
MLB: Micro Laminate Beam

NOM: Nominal
N: North
NIC: Not in Contract
NTS: Not To Scale

NO, #: Number

O: Non-Operable Window Section
OBS: Obscure
OC: On Center
OP: Opaque
OPG: Opening
OSB: Orientated Strand Board
OD: Outside Diameter

PNT: Paint(ed)
PBD: Particle Board
PRT: partition
PVMT: Pavement
PERF: Perforate(d)
PLAS: Plaster
PLAM: Plastic Laminate
PLT: Plate
PLYWD: Plywood
PCC: Precast Concrete
PCF: Pounds Per Cubic Foot
PLF: Pounds Per Linear Foot
PSF: Pounds Per Square Foot
PSI: Pounds Per Square Inch
PBF: Prefabricated
PRF: Preformed
PT: Pressure Treated
PL: Property Line
PH: Toilet Paper Hanger

QTY: Quantity
QT: Quarry Tile

RAD: Radius
REF: Reference
RFL: Reflect(ed),(ive),(or)

REFR: Ref
REG: Register
RE: Reinforced
REQD: Required
RA: Return Air
REV: Revision
R: Riser
RD: Rod
R&S: Rod and Shelf
RFG: Roofing
RM: Room
RO: Rough Opening

SCH: Schedule
SCN: Screen
SECT: Section
SGD: Sliding Glass Door
SHTH: Sheathing
SHT: Sheet
SH: Shelf, Shelving
SIM: Similar
SKL: Skylight
S: South
SLB: Slab
SLD: Slider(ing)
SPEC: Specification
SQ: Square
STD: Standard
STV: Stove
STL: Steel
STR: Structural
SA: Supply Air
SC: Solid Core
SW: Shear Wall
SS: Stainless Steel
SYS: System

TEL: Telephone

TEMP: Tempered
TK: Tight Knot
T&G: Tongue and Groove
T/O: Top of
TOC: Top of Concrete
TOW: Top of Wall
TB: Towel Bar
T: Tread
TS: Tubular Steel
TYP: Typical

UL: Underwriters Laboratory
UNF: Unfinished
UNO: Unless Noted Otherwise

VB: Vapor Barrier
VAR: Varnish
VIF: Verify in Field
VRN: Veneer
VERT: Vertical
VG: Vertical Grain
VIN: Vinyl Sheet

WL: Wall
WC: Water Closet
WH: Water Heater
WP: Water Proofing
WR: Weather Resistant
WRB: Weather Resistive Barrier
WWF: Welded Wire Fabric
WWM: Welded Wire Mesh
W: West
WIN: Window
W/O: Without
W/: With
WD: Wood

X: Operable Window Section

SITE

VICINITY MAP
SCALE: N.T.S.

THRIVE ARCHITECTS
Architect
259 South Street, Suite A
WAUKESHA, WI 53186
p: 833-380-6180

Project Info. — 22005
Riverside Park Restrooms
New Construction
600 Labaree St
Watertown, WI

Sheet Title
TITLE SHEET

Drawn by	Checked by
JAJ	DMR

Revisions

No.	Date	Description
	06.30.2023	Bid & Permit Set

2023-06-30 Bid & Permit Set

Sheet No.
T1.0

RIVERSIDE PARK RESTROOM - NEW CONSTRUCTION

812 LABAREE ST. | WATERTOWN, WI 53098

OCCUPANT LOAD PER TABLE 1004.1.2 TOTAL OCCUPANT LOAD = 183 OCCUPANTS				
OCCUPANCY	SF	FLOOR AREA	CALC. OCC.	ASSIGNED OCC.
UTILITY	1,602 SF	500/GROSS	3	45

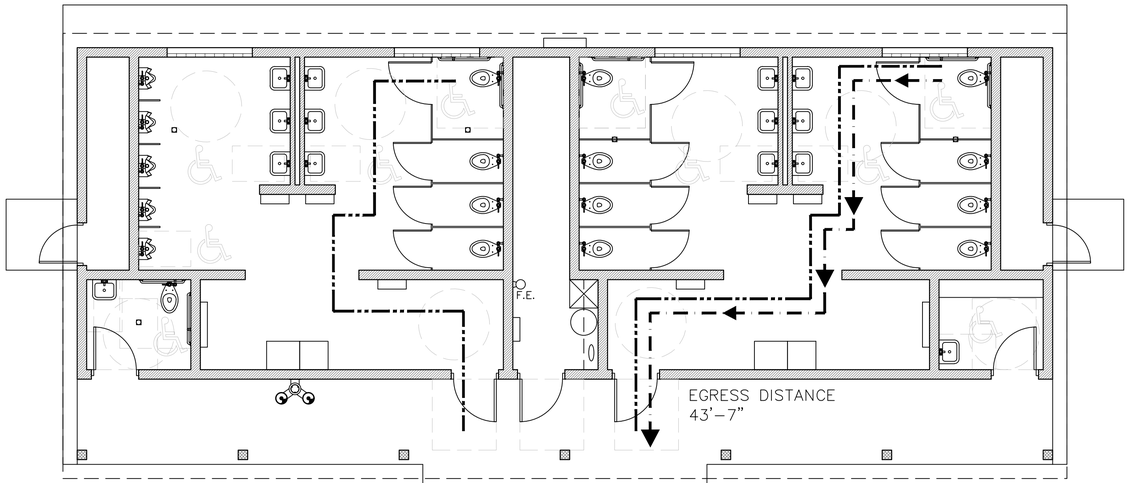
EGRESS REQUIREMENTS EGRESS WIDTH PER 1005.3			
# OF OCCUPANTS	EGRESS WIDTH FACTOR	EGRESS WIDTH REQUIRED	EGRESS WIDTH PROVIDED
45	.2 INCHES PER OCCUPANT	9"	34"

NO. OF EXITS REQUIRED PER SECTION 1006 = 1
NO. OF EXITS PROVIDED = 1
MAXIMUM EXIT TRAVEL DISTANCE PER TABLE 1017.2 = 200' (w/out SPRINKLER)

FIRE-RESISTANCE RATING SUMMARY REFER TO IBC CHAPTER 6	
CONSTRUCTION TYPE V-B	
PRIMARY STRUCTURAL FRAME	0
BEARING WALLS	
EXTERIOR	0
INTERIOR	0
NONBEARING WALLS	0
FLOOR CONSTRUCTION	0
ROOF CONSTRUCTION	0

ACCESSIBLE ROUTE

DELINEATES EXIT EGRESS PATH



FIRST FLOOR CODE PLAN 1
SCALE: N.T.S.

N

THRIVE ARCHITECTS
Architect
259 South Street, Suite A
WAUKESHA, WI 53186
p: 833-380-6180

Project Info. — 22005

Riverside Park Restrooms

New Construction

600 Labaree St
Watertown, WI

Sheet Title

CODE SHEET

Drawn by	Checked by
JAJ	DMR

Revisions

No.	Date	Description
	06.30.2023	Bid & Permit Set

2023-06-30 Bid & Permit Set

Sheet No.

T1.1

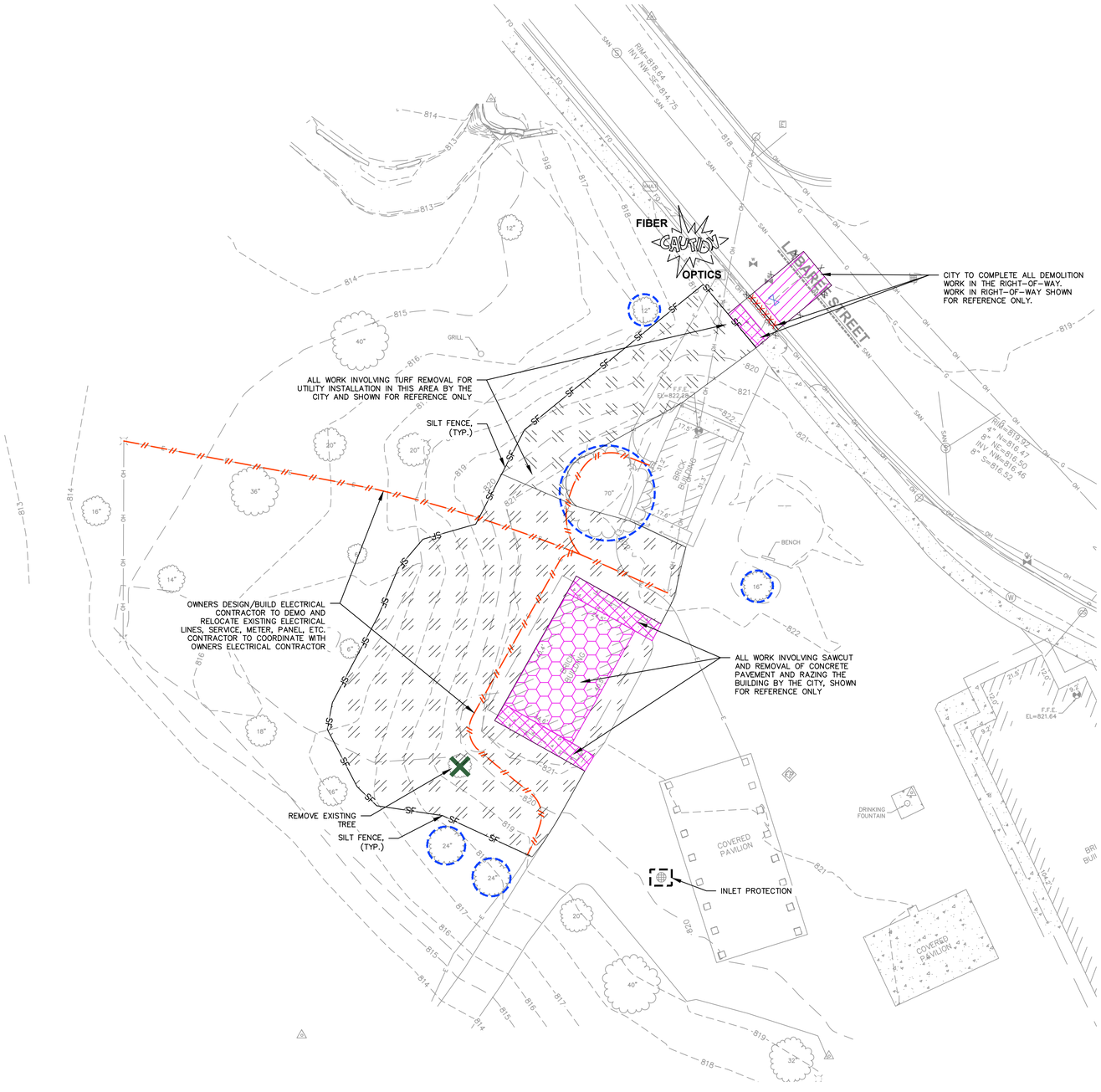
CONSTRUCTION SEQUENCING

1. INSTALL PERIMETER SILT FENCE AND INLET PROTECTION.
2. STRIP AND STOCKPILE TOPSOIL, INSTALL SILT FENCE AROUND PERIMETER OF STOCKPILE.
3. CONDUCT ROUGH GRADING EFFORTS AND INSTALL CHECK DAMS WITHIN DRAINAGE DITCHES AS NEEDED.
4. INSTALL UTILITY PIPING AND STRUCTURES, IMMEDIATELY INSTALL INLET PROTECTION.
5. COMPLETE INSTALLATION OF GRAVEL BASE COURSES, PLACEMENT OF CURBS, PAVEMENTS, WALKS, ETC.
6. FINAL GRADING BY CITY.
7. EROSION CONTROLS SHALL NOT BE REMOVED UNTIL SITE IS FULLY STABILIZED OR 70% VEGETATIVE COVER IS ESTABLISHED.

CONTRACTOR MAY MODIFY SEQUENCING AFTER ITEM NO. 1 AS NEEDED TO COMPLETE CONSTRUCTION IF EROSION CONTROLS ARE MAINTAINED IN ACCORDANCE WITH THE CONSTRUCTION SITE EROSION CONTROL REQUIREMENTS.

DEMOLITION NOTES

1. THIS PLAN INDICATES ITEMS ON THE PROPERTY INTENDED FOR DEMOLITION BASED ON THE CURRENT SITE DESIGN THAT HAVE BEEN IDENTIFIED BY A REASONABLE OBSERVATION OF THE EXISTING CONDITIONS THROUGH FIELD SURVEY RECONNAISSANCE, "DIGGER'S HOTLINE" LOCATION, AND GENERAL "STANDARD OF CARE". THERE MAY BE ADDITIONAL ITEMS THAT CAN NOT BE IDENTIFIED BY A REASONABLE ABOVE GROUND OBSERVATION, OF WHICH THE ENGINEER WOULD HAVE NO KNOWLEDGE OR MAY BE A PART OF ANOTHER DESIGN DISCIPLINE. IT IS THE CONTRACTOR'S/BIDDER'S RESPONSIBILITY TO REVIEW THE PLANS, INSPECT THE SITE AND PROVIDE THEIR OWN DUE DILIGENCE TO INCLUDE IN THEIR BID WHAT ADDITIONAL ITEMS, IN THEIR OPINION, MAY BE NECESSARY FOR DEMOLITION. ANY ADDITIONAL ITEMS IDENTIFIED BY THE CONTRACTOR/BIDDER SHALL BE IDENTIFIED IN THE BID AND REPORTED TO THE ENGINEER OF RECORD. JSD TAKES NO RESPONSIBILITY FOR ITEMS ON THE PROPERTY THAT COULD NOT BE LOCATED BY A REASONABLE OBSERVATION OF THE PROPERTY OR OF WHICH THEY WOULD HAVE NO KNOWLEDGE.
2. CONTRACTOR SHALL KEEP ALL STREETS AND PRIVATE DRIVES FREE AND CLEAR OF ALL CONSTRUCTION RELATED DIRT, DUST AND DEBRIS.
3. ALL TREES WITHIN THE CONSTRUCTION LIMITS SHALL BE PROTECTED UNLESS SPECIFICALLY CALLED OUT FOR REMOVAL. ALL TREES TO BE REMOVED SHALL BE REMOVED IN THEIR ENTIRETY AND STUMPS SHALL BE GROUND TO PROPOSED SUBGRADE.
4. ALL LIGHT POLES TO BE REMOVED SHALL BE REMOVED IN THEIR ENTIRETY, INCLUDING BASE AND ALL APPURTENANCES. SALVAGE FOR RELOCATION. COORDINATE RELOCATION AND/OR ABANDONMENT OF ALL ELECTRIC LINES WITH ELECTRICAL ENGINEER AND OWNER PRIOR TO DEMOLITION.
5. ABANDONED/REMOVED ITEMS SHALL BE DISPOSED OF OFF SITE UNLESS OTHERWISE NOTED.
6. CONTRACTOR TO REPLACE ALL SIDEWALK AND CURB AND GUTTER ABUTTING THE PROPERTIES, WHICH IS DAMAGED BY THE CONSTRUCTION, OR ANY SIDEWALK AND CURB AND GUTTER THAT THE CITY ENGINEER DETERMINES NEEDS TO BE REPLACED BECAUSE IT IS NOT AT A DESIRABLE GRADE REGARDLESS OF WHETHER THE CONDITION EXISTED PRIOR TO BEGINNING CONSTRUCTION.
7. PRIOR TO CONSTRUCTION, THE CONTRACTOR IS RESPONSIBLE FOR:
   - 7.1. EXAMINE ALL SITE CONDITIONS RELATIVE TO THE CONDITIONS INDICATED ON THE ENGINEERING DRAWINGS. ANY DISCREPANCIES ARE TO BE REPORTED IMMEDIATELY TO THE ENGINEER AND RESOLVED PRIOR TO THE START OF CONSTRUCTION.
   - 7.2. VERIFYING UTILITY ELEVATIONS AND NOTIFYING ENGINEER OF ANY DISCREPANCIES. NO WORK SHALL BE PERFORMED UNTIL THE DISCREPANCIES ARE RESOLVED.
   - 7.3. NOTIFYING ALL UTILITIES PRIOR TO THE REMOVAL OF ANY UNDERGROUND UTILITIES.
   - 7.4. NOTIFYING THE DESIGN ENGINEER AND LOCAL CONTROLLING MUNICIPALITY 48 HOURS PRIOR TO THE START OF CONSTRUCTION TO ARRANGE FOR APPROPRIATE CONSTRUCTION INSPECTION.
8. ANY SANITARY SEWER, SANITARY SEWER SERVICES, WATER MAIN, WATER SERVICES, STORM SEWER, OR OTHER UTILITIES, WHICH ARE DAMAGED BY THE CONTRACTORS, SHALL BE REPAIRED TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.
9. CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY DURING THE CONSTRUCTION OF THESE IMPROVEMENTS.
10. CONTRACTOR TO COORDINATE PRIVATE UTILITY REMOVAL / ABANDONMENT AND NECESSARY RELOCATION WITH RESPECTIVE UTILITY COMPANY. COORDINATION REQUIRED PRIOR TO CONSTRUCTION.
11. ALL DEMOLITION SHALL BE IN ACCORDANCE WITH THE APPROVED MUNICIPALITY RECYCLING PLAN.
12. ANY CONTAMINATED SOILS SHALL BE REMOVED IN ACCORDANCE WITH FEDERAL AND STATE REGULATIONS TO AN APPROVED LANDFILL.
13. ALL EXISTING UTILITIES TO BE FIELD LOCATED AND FLAGGED BY CONTRACTOR.
14. EXISTING FIBER OPTIC LINE TO BE CLEARLY MARKED PRIOR TO ANY EXCAVATION. CONTRACTOR TO NOTIFY ENGINEER IMMEDIATELY IF ANY DISCREPANCIES OCCUR IN THE LOCATION SHOWN OR PROPOSED IMPROVEMENTS IMPACTING EXISTING FIBER OPTIC LINE LOCATION.
15. ALL PERIMETER EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO THE START OF DEMOLITION ACTIVITIES. CONTRACTOR SHALL KEEP ALL STREETS AND PAVEMENT FREE AND CLEAR OF ALL CONSTRUCTION RELATED DIRT, DUST AND DEBRIS.



LEGEND

- PROPERTY LINE
- EASEMENT LINE
- RIGHT OF WAY LINE
- EXISTING ASPHALT PAVEMENT AND BASE TO BE REMOVED BY CITY, N.I.C.
- EXISTING CONCRETE PAVEMENT AND BASE TO BE REMOVED BY THE CITY, N.I.C.
- EXISTING BUILDING TO BE REMOVED BY THE CITY, REFER TO BLDG. PLAN, N.I.C.
- SF SF — SILT FENCE
- PAVEMENT SAWCUT BY CITY, N.I.C.
- EXISTING CURB TO BE REMOVED BY CITY, N.I.C.
- REMOVE TREE
- EXISTING ELECTRICAL TO BE REMOVED AND RELOCATED BY OTHERS, N.I.C.
- PROTECT EXISTING TREES
- INLET PROTECTION
- REMOVE AND DISPOSE OF VEGETATION, STRIP AND STOCKPILE TOPSOIL, THICKNESS MAY VARY
- VEGETATION AND TOPSOIL PREVIOUSLY REMOVED BY CITY FOR UTILITY INSTALLATION, N.I.C.

CIVIL SHEET INDEX

north

SCALE IN FEET

20' 0 20'

DIGGERS HOTLINE
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JSD
MILWAUKEE REGIONAL OFFICE
W238 N1610 BUSSE ROAD, SUITE 100
WAUKESHA, WISCONSIN 53188
P. 262.513.0666
JSD #21-11127

THRIVE ARCHITECTS
Architect
259 South Street, Suite A
WAUKESHA, WI 53186
p: 833-380-6180

Project Info. — 22005

Riverside Park Restrooms

New Construction

600 Labaree St
Watertown, WI

Sheet Title

DEMOLITION PLAN

Drawn by	Checked by
YT	KCB

Revisions

No.	Date	Description
1	06.30.2023	Bid & Permit Set

2023-06-30 Bid & Permit Set

Sheet No.

C1.0

GENERAL NOTES

1. WATER AND SANITARY SEWER WERE INSTALLED BY THE CITY AND STUBBED TO THE BACK OF THE BUILDING.
2. ROUGH GRADE IN THE CONTRACT.
   FINISH GRADE, SODDING, LANDSCAPING, AND EROSION MATTING NOT IN CONTRACT. CITY TO COMPLETE THE WORK.
3. OLD BUILDING ELECTRICAL IS DISCONNECTED.
4. ELECTRICAL CONTRACTOR TO COORDINATE OUTDOOR PANEL, METER, ETC.
5. BUILDING AND CONCRETE SIDEWALK IN CONTRACT.

PAVING NOTES

1. GENERAL

1.1. ALL PAVING SHALL CONFORM TO "STATE OF WISCONSIN STANDARD SPECIFICATIONS FOR HIGHWAY & STRUCTURE CONSTRUCTION, LATEST EDITION, APPLICABLE CITY OF WATERTOWN ORDINANCES.

1.2. SURFACE PREPARATION – NOTIFY ENGINEER/OWNER OF UNSATISFACTORY CONDITIONS. DO NOT BEGIN PAVING WORK UNTIL DEFICIENT SUBBASE AREAS HAVE BEEN CORRECTED AND ARE READY TO RECEIVE PAVING.

2. CONCRETE PAVING SPECIFICATIONS

2.1. CONCRETE PAVING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF SECTIONS 415 AND 416 OF THE STATE HIGHWAY SPECIFICATIONS.

2.2. CONTRACTOR SHALL SAWCUT ASPHALT AND REMOVE AS NECESSARY TO CREATE A CLEAN, STRUCTURALLY SOUND EDGE TO ABUT CONCRETE TO.

2.3. CONCRETE PAVEMENT SHALL BE REINFORCED WITH NOVOMESH 950 (OR EQUAL) FIBER REINFORCEMENT AT A RATE OF 5 LBS/CUBIC YARD.

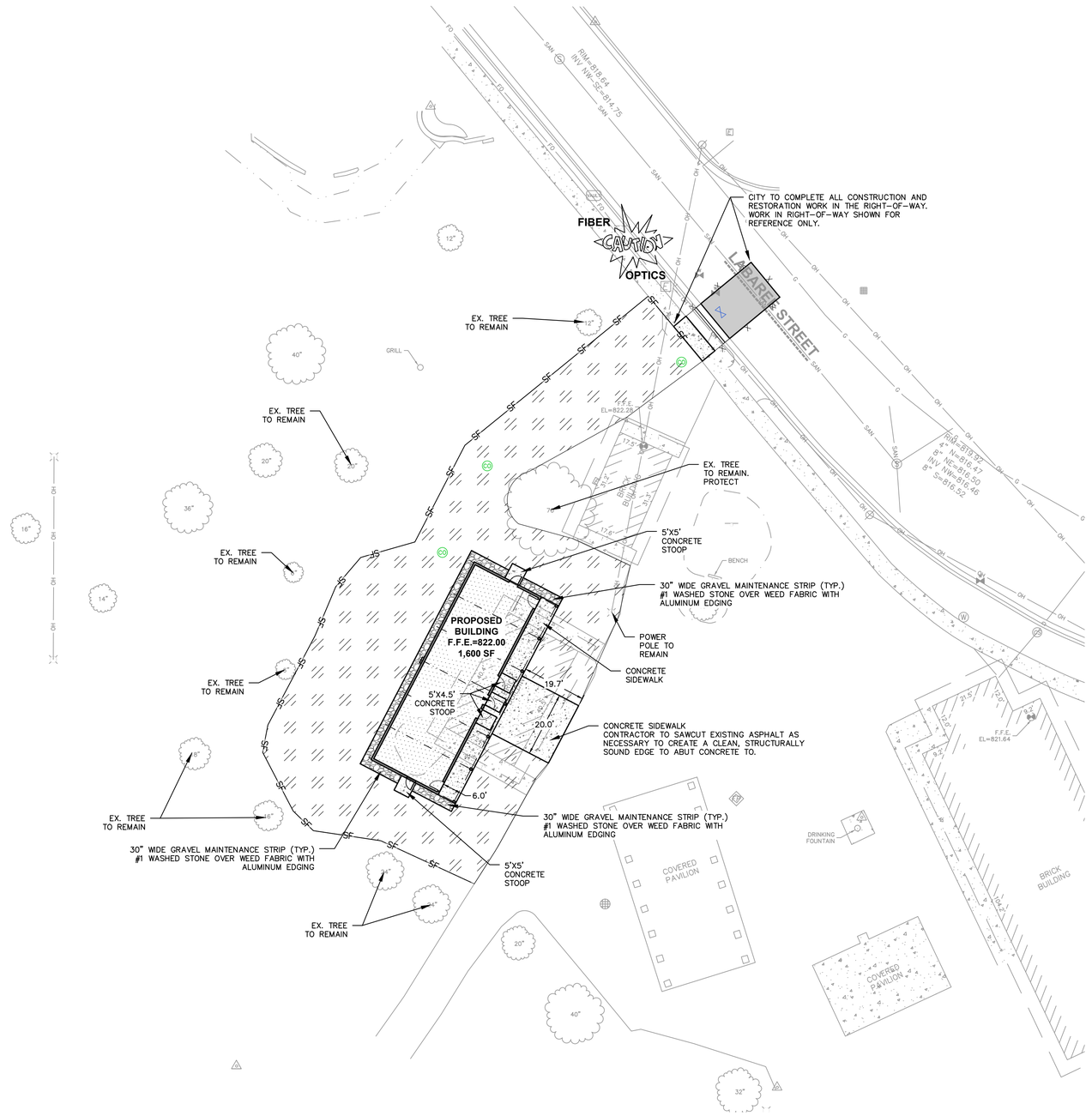
2.4. CURING COMPOUNDS SHALL CONFORM TO SECTION 415 OF THE STATE HIGHWAY SPECIFICATIONS.

2.5. CONTRACTOR SHALL PROVIDE CONTROL JOINTS AND CONSTRUCTION JOINTS OF ONE-QUARTER CONCRETE THICKNESS AT AN EQUAL RATIO OF LENGTH TO WIDTH WHEREVER POSSIBLE WITH A MAXIMUM LENGTH BETWEEN JOINTS OF 8' ON CENTER.

2.6. CONTRACTOR SHALL PROVIDE EXPANSION JOINTS IN SIDEWALKS AT A MAXIMUM 24' ON CENTER.

2.7. EXTERIOR CONCRETE SURFACES SHALL BE BROOM FINISHED.

2.8. ALL CONCRETE SURFACES TO BE SEALED WITH TYPE TK-26UV CONCRETE SEALANT.



SITE INFORMATION BLOCK

SITE ADDRESS	812 LABAREE ST (ZONING SR-4)
PROPERTY ACREAGE	11.38 ACRES
DISTURBANCE AREA	0.23 ACRES
NUMBER OF BUILDING STORIES	
TOTAL BUILDING SQUARE FOOTAGE	1,600 SF

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- RIGHT OF WAY LINE
- STANDARD CURB AND GUTTER BY CITY
- LIGHT DUTY ASPHALT PAVEMENT BY CITY
- CONCRETE SIDEWALK
  5" CONCRETE
  6" CRUSHED AGGREGATE BASE COURSE
- 30" WIDE GRAVEL MAINTENANCE STRIP
- SAWCUT PAVEMENT BY CITY
- SANITARY CLEANOUT
- WATER VALVE
- CONTRACTOR TO ROUGH GRADE AREA. FINISH GRADE, SEEDING, AND EROSION MATTING BY CITY.

north
SCALE IN FEET
20' 0 20'

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THRIVE ARCHITECTS
Architect
259 South Street, Suite A
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Project Info. — 22005

Riverside Park Restrooms

New Construction

600 Labaree St
Watertown, WI

Sheet Title

SITE LAYOUT PLAN

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2023-06-30 Bid & Permit Set

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C2.0

GENERAL NOTES

1. ALL WORK IN THE ROW AND/OR PUBLIC EASEMENTS SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR SEWER & WATER CONSTRUCTION IN WISCONSIN AND MUNICIPAL REQUIREMENTS.
2. EXISTING GRADE SPOT ELEVATIONS SHOWN FOR INFORMATIONAL PURPOSES. DURING CONSTRUCTION MATCH EXISTING GRADES AT CONSTRUCTION LIMITS.
3. NO SITE GRADING OUTSIDE OR DOWNSLOPE OF PROPOSED SILT FENCE LOCATION. NO LAND DISTURBANCE BEYOND PROPERTY LINES.
4. JSD SHALL BE HELD HARMLESS AND DOES NOT WARRANT ANY DEVIATIONS BY THE OWNER/CONTRACTOR FROM THE APPROVED CONSTRUCTION PLANS THAT MAY RESULT IN DISCIPLINARY ACTIONS BY ANY OR ALL REGULATORY AGENCIES.

GRADING AND SEEDING NOTES

1. ALL PROPOSED GRADES SHOWN ARE FINISHED GRADES. CONTRACTOR SHALL VERIFY ALL GRADES, MAKE SURE ALL AREAS DRAIN PROPERLY AND SHALL REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR COMPUTATIONS OF ALL GRADING QUANTITIES. WHILE JSD PROFESSIONAL SERVICES, INC. ATTEMPTS TO PROVIDE A COST EFFECTIVE APPROACH TO BALANCE EARTHWORK, GRADING DESIGN IS BASED ON MANY FACTORS, INCLUDING SAFETY, AESTHETICS, AND COMMON ENGINEERING STANDARDS OF CARE. THEREFORE, NO GUARANTEE CAN BE MADE FOR A BALANCED SITE.
3. PARKING LOT AND DRIVEWAY ELEVATIONS ARE PAVEMENT GRADES, NOT TOP OF CURB GRADES, UNLESS OTHERWISE NOTED.
4. ANY WORK WITHIN RIGHT-OF-WAY SHALL BE PROPERLY PERMITTED AND COORDINATED WITH THE APPROPRIATE OFFICIALS PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES. ALL GRADING WITHIN RIGHT-OF-WAY IS SUBJECT TO APPROVAL BY SAID OFFICIALS.
5. CONTRACTOR SHALL PROVIDE NOTICE TO THE MUNICIPALITY IN ADVANCE OF ANY SOIL DISTURBING ACTIVITIES, IN ACCORDANCE WITH MUNICIPAL REQUIREMENTS.

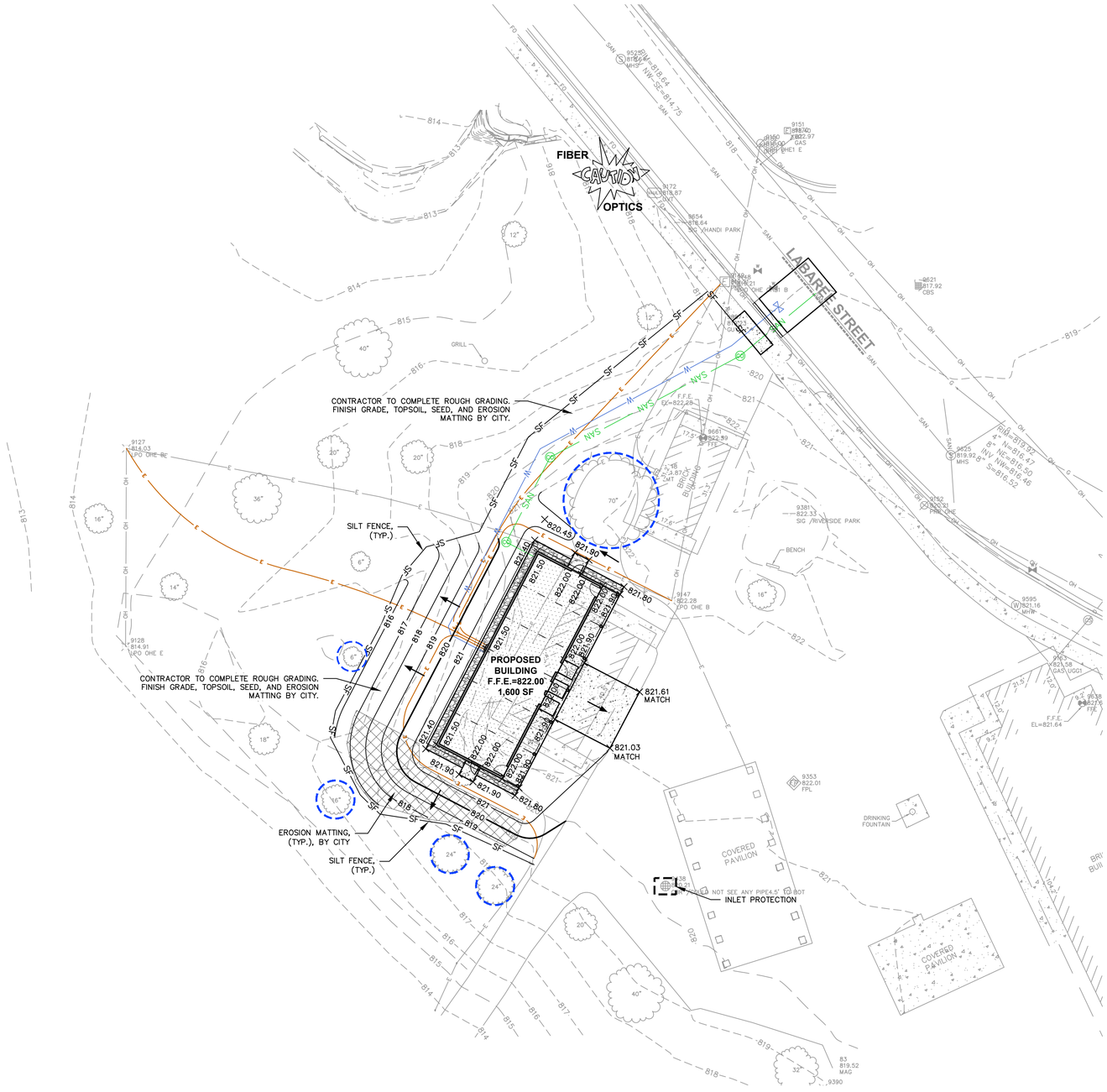
THE FOLLOWING NOTES APPLY TO RESTORATION WORK COMPLETED BY THE CITY, N.I.C.

6. ALL DISTURBED AREAS SHALL BE SODDED AND/OR SEEDED AND MULCHED IMMEDIATELY FOLLOWING GRADING ACTIVITIES. SOD/SEED MIX TO BE IN ACCORDANCE WITH LANDSCAPE PLAN.
7. CITY SHALL WATER ALL NEWLY SODDED/SEEDED AREAS DURING THE SUMMER MONTHS WHENEVER THERE IS A 7 DAY LAPSE WITH NO SIGNIFICANT RAINFALL.
8. CITY TO DEEP TILL ALL COMPACTED PERVIOUS SURFACES PRIOR TO SODDING AND/OR SEEDING AND MULCHING.
9. ALL SLOPES 20% OR GREATER SHALL BE TEMPORARY SEEDED, MULCHED, OR OTHER MEANS OF COVER PLACED ON THEM WITHIN 2 WEEKS OF DISTURBANCE.
10. ALL EXPOSED SOIL AREAS THAT WILL NOT BE BROUGHT TO FINAL GRADE OR ON WHICH LAND DISTURBING ACTIVITIES WILL NOT BE PERFORMED FOR A PERIOD GREATER THAN 30 DAYS AND REQUIRE VEGETATIVE COVER FOR LESS THAN 1 YEAR, REQUIRE TEMPORARY SEEDING FOR EROSION CONTROL. SEEDING FOR EROSION CONTROL SHALL BE IN ACCORDANCE WITH WDNR TECHNICAL STANDARD 1059 AND CITY OF WATERTOWN ORDINANCE.

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- RIGHT OF WAY LINE
- STANDARD CURB AND GUTTER
- SF SILT FENCE / SILT SOCK
- 959 PROPOSED 1 FOOT CONTOUR
- 960 PROPOSED 5 FOOT CONTOUR
- 959 EXISTING 1 FOOT CONTOUR
- 960 EXISTING 5 FOOT CONTOUR
- PROTECT EXISTING TREES
- EROSION MATTING, BY CITY
- SAN SANITARY SERVICE
- SANITARY CLEANOUT
- W WATER SERVICE
- WATER VALVE
- INLET PROTECTION - SILT LOGS OR STAKED STRAW BALES
- DRAINAGE ARROW

SEE UTILITY SHEET FOR ADDITIONAL INFORMATION



north
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Project Info. — 22005

Riverside Park Restrooms

New Construction

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Watertown, WI

Sheet Title

GRADING AND EROSION CONTROL PLAN

Drawn by	Checked by
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2023-06-30 Bid & Permit Set

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C3.0

UTILITY PLAN AND NOTES: FOR REFERENCE ONLY - SCOPE NOT IN CONTRACT. UTILITIES BY CITY, CONTRACTOR TO COORDINATE WITH CITY AND CITY'S CONTRACTORS.

1. ALL EXISTING UTILITIES ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATIONS OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. CONTRACTOR/OWNER SHALL CALL "DIGGER'S HOTLINE" PRIOR TO ANY CONSTRUCTION.

2. PRIOR TO CONSTRUCTION, THE PRIME CONTRACTOR IS RESPONSIBLE FOR: EXAMINING ALL SITE CONDITIONS RELATIVE TO THE CONDITIONS INDICATED ON THE ENGINEERING DRAWINGS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER AND RESOLVED PRIOR TO THE START OF CONSTRUCTION.
   - OBTAINING ALL PERMITS INCLUDING PERMIT COSTS, TAP FEES, METER DEPOSITS, BONDS, AND ALL OTHER FEES REQUIRED FOR PROPOSED WORK TO OBTAIN OCCUPANCY.
   - VERIFYING ALL ELEVATIONS, LOCATIONS AND SIZES OF SANITARY, WATER AND STORM LATERALS AND CHECK ALL UTILITY CROSSINGS FOR CONFLICTS. NOTIFY ENGINEER OF ANY DISCREPANCY. NO WORK SHALL BE PERFORMED UNTIL THE DISCREPANCY IS RESOLVED.
   - NOTIFYING ALL UTILITIES PRIOR TO INSTALLATION OF ANY UNDERGROUND IMPROVEMENTS.
   - NOTIFYING THE DESIGN ENGINEER AND MUNICIPALITY 48 HOURS PRIOR TO THE START OF CONSTRUCTION TO ARRANGE FOR APPROPRIATE CONSTRUCTION OBSERVATION.
   - COORDINATING ALL CONSTRUCTION WITH OTHER CONTRACTORS INVOLVED WITH CONSTRUCTION OF THE PROPOSED DEVELOPMENT AND FOR REPORTING ANY ERRORS OR DISCREPANCIES BETWEEN THESE PLANS AND PLANS PREPARED BY OTHERS.

3. ALL UTILITY WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR SEWER AND WATER CONSTRUCTION IN WISCONSIN – AND ALL STATE AND LOCAL CODES AND SPECIFICATIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE WHICH SPECIFICATIONS AND CODES APPLY, AND TO COORDINATE ALL CONSTRUCTION ACTIVITIES WITH THE APPROPRIATE LOCAL AND STATE AUTHORITIES.

4. SPECIFICATIONS SHALL COMPLY WITH THE CITY OF WATERTOWN SPECIAL PROVISIONS.

5. LENGTHS OF ALL UTILITIES ARE TO CENTER OF STRUCTURES OR FITTINGS AND MAY VARY SLIGHTLY FROM PLAN. LENGTHS SHALL BE VERIFIED IN THE FIELD DURING CONSTRUCTION.

6. CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY DURING THE CONSTRUCTION OF IMPROVEMENTS.

7. CONTRACTOR SHALL INSTALL A PEDESTRIAN FENCE AROUND ALL EXCAVATIONS TO BE LEFT OPEN OVER NIGHT AS REQUIRED IN CONSTRUCTION SITES WHERE THE POTENTIAL FOR PEDESTRIAN INJURY EXISTS.

8. CONTRACTOR SHALL ADJUST AND/OR RECONSTRUCT ALL UTILITY COVERS (SUCH AS MANHOLE COVERS, VALVE BOX COVERS, ETC.) TO MATCH THE FINISHED GRADES OF THE AREAS EFFECTED BY THE CONSTRUCTION.

9. THE PRIME CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL CONSTRUCTION WITH OTHER CONTRACTORS INVOLVED WITH CONSTRUCTION OF THE PROPOSED DEVELOPMENT AND FOR REPORTING ANY ERRORS OR DISCREPANCIES BETWEEN THESE PLANS AND PLANS PREPARED BY OTHERS.

10. ANY SANITARY SEWER, SANITARY SEWER SERVICES, WATER MAIN, WATER SERVICES, STORM SEWER, OR OTHER UTILITIES, WHICH ARE DAMAGED BY THE CONTRACTORS, SHALL BE REPAIRED TO THE OWNER'S SATISFACTION AT THE CONTRACTOR'S EXPENSE.

11. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE ENGINEER WITH AS–BUILT CONDITIONS OF THE DESIGNATED IMPROVEMENTS IN ORDER THAT THE APPROPRIATE DRAWINGS CAN BE PREPARED, IF REQUIRED. ANY CHANGES TO THE DRAWINGS OR ADDITIONAL ITEMS MUST BE REPORTED TO THE ENGINEER AS WORK PROGRESSES.

12. WATER MAIN SPECIFICATIONS –

    PIPE – POLYVINYL CHLORIDE (PVC) PIPE SHALL MEET THE REQUIREMENTS OF AWWA STANDARD C–900, CLASS 150, DR–18, WITH CAST IRON O.D. AND INTEGRAL ELASTOMERIC BELL AND SPIGOT JOINTS. NON–METALLIC WATER MAINS SHALL BE INSTALLED WITH BLUE INSULATION TRACER WIRE AND CONFORM WITH SPS 382.30(11)(h).

    VALVES AND VALVE BOXES – GATE VALVES SHALL BE AWWA GATE VALVES MEETING THE REQUIREMENTS OF AWWA C–500 AND CHAPTER 8.27.0 OF THE "STANDARD SPECIFICATIONS". GATE VALVES AND VALVE BOXES SHALL CONFORM TO LOCAL PLUMBING ORDINANCES.

    BEDDING AND COVER MATERIAL – PIPE BEDDING AND COVER MATERIAL SHALL BE SAND, CRUSHED STONE CHIPS OR CRUSHED STONE SCREENINGS CONFORMING TO CHAPTER 8.43.2 OF THE "STANDARD SPECIFICATIONS".

    BACKFILL: PRIVATE SERVICE – BACKFILL MATERIAL AND INSTALLATION SHALL BE IN ACCORDANCE WITH CHAPTER 2.6.0 OF THE "STANDARD SPECIFICATIONS". GRAVEL BACKFILL IS REQUIRED IN ALL PAVED AREAS AND TO A POINT 5 FEET BEYOND THE EDGE OF PAVEMENT. TRENCHES RUNNING PARALLEL TO AND LESS THAN 5 FEET FROM THE EDGE OF PAVEMENT SHALL ALSO REQUIRE GRAVEL BACKFILL. LANDSCAPED AREAS MAY BE BACKFILLED WITH EXCAVATED MATERIAL IN CONFORMANCE WITH SECTION 8.43.5 OF THE "STANDARD SPECIFICATIONS".

    BACKFILL AND BEDDING: PUBLIC R.O.W – ALL EXCAVATION IN THE PUBLIC STREET RIGHT–OF–WAY HALL BE BACKFILLED WITH SLURRY IN ACCORDANCE WITH LOCAL REGULATIONS.

13. SANITARY SEWER SPECIFICATIONS –

    PIPE – SANITARY SEWER PIPE MATERIAL SHALL BE POLYVINYL CHLORIDE (PVC) MEETING REQUIREMENTS OF ASTM D 3034, SDR–35, WITH INTEGRAL BELL TYPE FLEXIBLE ELASTOMERIC JOINTS, MEETING THE REQUIREMENTS OF ASTM D–3212.

    BEDDING AND COVER MATERIAL – BEDDING AND COVER MATERIAL SHALL CONFORM TO THE APPROPRIATE SECTIONS OF THE "STANDARD SPECIFICATION" WITH THE FOLLOWING MODIFICATION: "COVER MATERIAL SHALL BE THE SAME AS USED FOR BEDDING AND SHALL CONFORM TO SECTION 8.43.2 (A). BEDDING AND COVER MATERIAL SHALL BE PLACED IN A MINIMUM OF THREE SEPARATE LIFTS, OR AS REQUIRED TO INSURE ADEQUATE COMPACTING OF THESE MATERIALS, WITH ONE LIFT OF BEDDING MATERIAL ENDING AT OR NEAR THE SPRINGLINE OF THE PIPE. THE CONTRACTOR SHALL TAKE CARE TO COMPLETELY WORK BEDDING MATERIAL UNDER THE HAUNCH OF THE PIPE TO PROVIDE ADEQUATE SIDE SUPPORT."

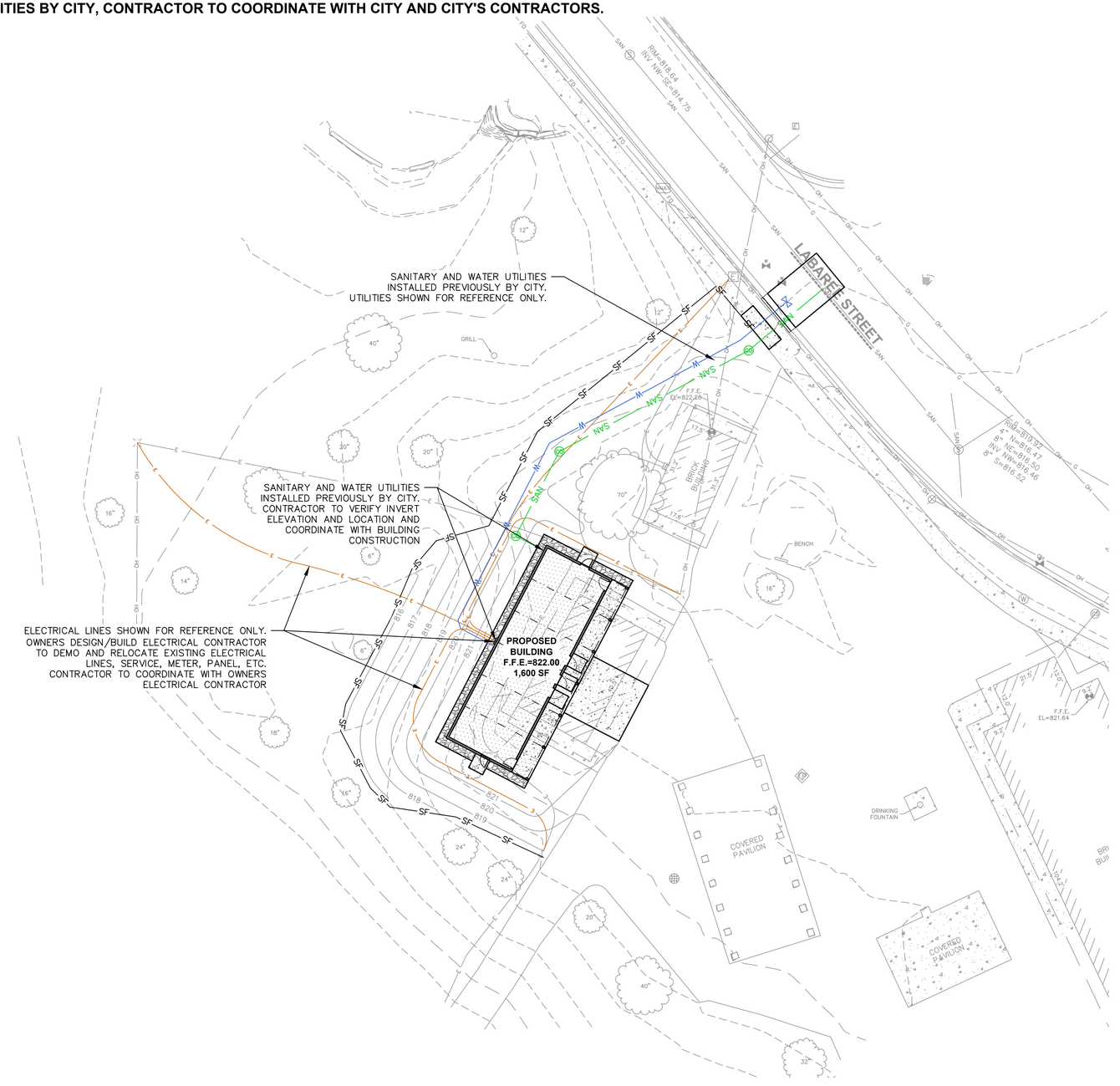
    BACKFILL: PRIVATE SERVICE – BACKFILL MATERIAL AND INSTALLATION SHALL BE IN ACCORDANCE CHAPTER 2.6.0 OF THE "STANDARD SPECIFICATIONS." GRAVEL BACKFILL IS REQUIRED IN ALL PAVED AREAS AND TO A POINT 5 FEET BEYOND THE EDGE OF PAVEMENT. TRENCHES RUNNING PARALLEL TO AND LESS THAN 5 FEET FROM THE EDGE OF PAVEMENT SHALL ALSO REQUIRE GRAVEL BACKFILL. LANDSCAPED AREAS MAY BE BACKFILLED WITH EXCAVATED MATERIAL IN CONFORMANCE WITH SECTION 8.43.5 OF THE "STANDARD SPECIFICATIONS."

    BACKFILL AND BEDDING: PUBLIC R.O.W – ALL EXCAVATION IN THE PUBLIC STREET RIGHT–OF–WAY HALL BE BACKFILLED WITH SLURRY IN ACCORDANCE WITH LOCAL REGULATIONS.

14. WATERMAIN AND SANITARY SEWER SHALL BE INSULATED WHEREVER THE DEPTH OF COVER IS LESS THAN 6 FEET. INSULATION AND INSTALLATION OF INSULATION SHALL BE CONFORMING WITH CHAPTER 4.17.0 "INSULATION" OF THE STANDARD SPECIFICATIONS FOR SEWER AND WATER CONSTRUCTION IN WISCONSIN 6TH EDITION UPDATED WITH ITS LATEST ADDENDUM (TYP.).

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- RIGHT OF WAY LINE
- STANDARD CURB AND GUTTER
- SF SILT FENCE
- SAN SANITARY SERVICE
- SANITARY CLEANOUT
- W WATER SERVICE
- WATER VALVE



north

SCALE IN FEET

20' 0 20'

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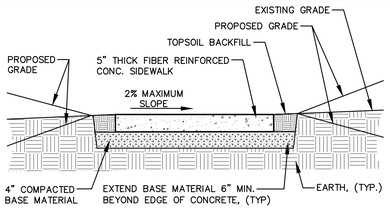
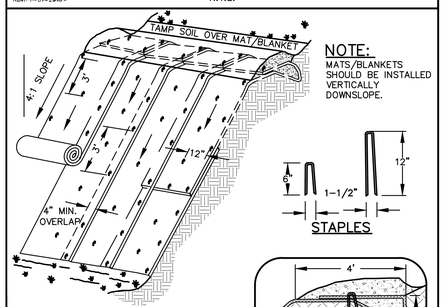


NOTE: CONCRETE PAVEMENT SHALL BE REINFORCED WITH NOVOMESH 950 (OR EQUAL) FIBER REINFORCEMENT AT A RATE OF 5 LBS/CUBIC YARD.

CONCRETE SIDEWALK

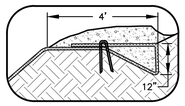
REV. 11-19-2018

N.T.S.



NOTE:
MATS/BLANKETS SHOULD BE INSTALLED VERTICALLY DOWNSLOPE.

STAPLES



BERM

ISOMETRIC VIEW
TYPICAL SLOPE SOIL STABILIZATION

GENERAL NOTES:

1. EROSION MAT CONSTRUCTION SHALL BE IN ACCORDANCE WITH WISCONSIN DNR TECHNICAL STANDARD 1052 "NON-CHANNEL EROSION MAT".
2. ONLY WisDOT EROSION CONTROL PRODUCT ACCEPTABILITY LIST (PAL) APPROVED MATS SHALL BE ALLOWED. REFER TO EROSION CONTROL PLAN FOR EXACT MAT CLASSIFICATION.
3. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
4. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.
5. ONLY WisDOT EROSION CONTROL PRODUCT ACCEPTABILITY LIST (PAL) APPROVED MATS SHALL BE ALLOWED. REFER TO EROSION CONTROL PLAN FOR EXACT MAT CLASSIFICATION.

EROSION MATTING

REV. 11-19-2018

N.T.S.

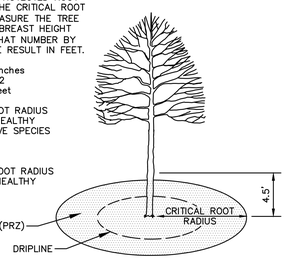
APPROXIMATE A TREE'S PROTECTED ROOT ZONE BY CALCULATING THE CRITICAL ROOT RADIUS (CRR). FIRST, MEASURE THE TREE DIAMETER IN INCHES AT BREAST HEIGHT (DBH). THEN MULTIPLY THAT NUMBER BY 1.5 OR 1.0. EXPRESS THE RESULT IN FEET.

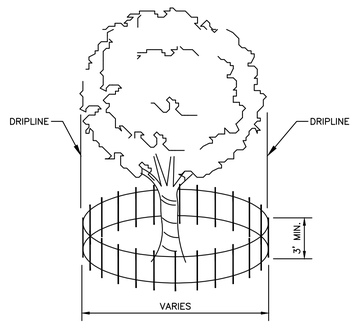
EXAMPLE: DBH = 8 inches
8 x 1.5 = 12
CRR = 12 feet

DBH x 1.5 = RITICAL ROOT RADIUS FOR OLDER, UNHEALTHY OR SENSITIVE SPECIES

OR

DBH x 1.0 = CRITICAL ROOT RADIUS FOR YOUNGER, HEALTHY OR TOLERANT SPECIES



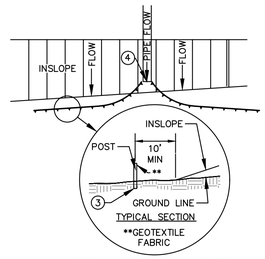


NOTE:
1. CONTRACTOR SHALL INSTALL TREE PROTECTION FENCING IN THE AREA SURROUNDING THE TREE WITHIN THE CRITICAL ROOT RADIUS
2. NO EXCAVATION IS PERMITTED WITHIN THE CRITICAL ROOT RADIUS
3. IF EXCAVATION WITHIN THE CRITICAL ROOT RADIUS OF ANY TREE IS NECESSARY, CONTRACTOR SHALL CONTACT CITY FORESTER PRIOR TO EXCAVATION TO ASSESS THE IMPACT TO THE TREE AND ROOT SYSTEM.

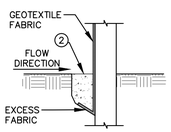
TREE PROTECTION DETAIL

REV. 01-04-2019

N.T.S.

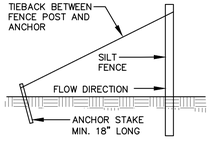


SILT FENCE ALONG SLOPES & OUTFALLS

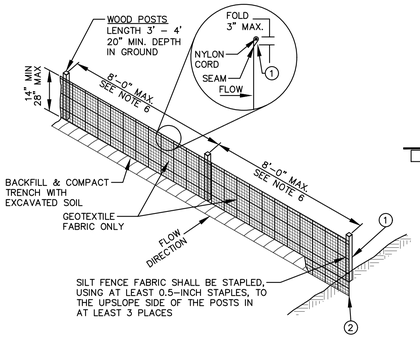


NOTE:
ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQUIRED IN UNSTABLE SOILS.

TRENCH DETAIL



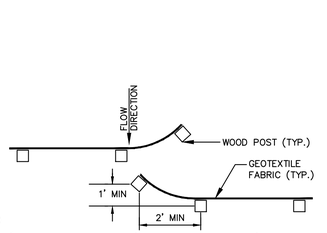
SILT FENCE TIE BACK
(WHEN ADDITIONAL SUPPORT REQUIRED)



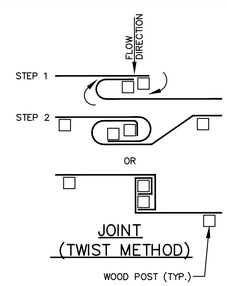
REV. 7-01-2019

SILT FENCE

N.T.S.



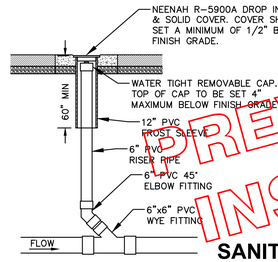
JOINT (HOOK METHOD)



JOINT (TWIST METHOD)

GENERAL NOTES:

1. SILT FENCE SHALL BE ANCHORED BY SPREADING AT LEAST 8-INCHES OF FABRIC IN A 4-INCH WIDE AND 6-INCH DEEP TRENCH OR 6-INCH DEEP V-TRENCH ON THE UPSLOPE SIDE OF THE FENCE. TRENCHES SHALL NOT BE EXCAVATED WIDER OR DEEPER THAN NECESSARY FOR PROPER INSTALLATION.
2. FOLD MATERIAL TO FIT TRENCH AND BACKFILL AND COMPACT TRENCH WITH EXCAVATED SOIL.
3. WOOD POSTS SHALL BE A MINIMUM SIZE OF 1.125-INCHES x 1.125-INCHES OF DRIED OAK OR HICKORY.
4. SILT FENCE TO EXTEND ABOVE THE TOP OF PIPE.
5. SILT FENCE CONSTRUCTION AND GEOTEXTILE FABRIC SHALL CONFORM TO WDNR TECHNICAL STANDARD 1056.
6. POST SPACING SHALL BE SELECTED BASED ON GEOTEXTILE FABRIC (8-FEET FOR WOVEN & 3-FEET FOR NON-WOVEN)

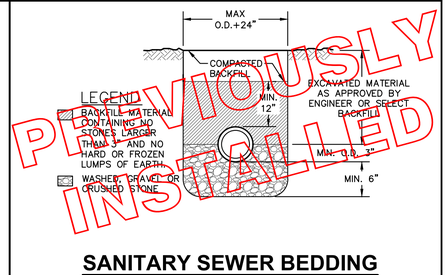


Comm Table 82.35

Dia of Lateral	Min Dia of Cleanout Riser	Min Dia of Riser Cap
1.5	1.5	1.5
2	1.5	1.5
3	3	2.5
4	4	3.5
5	5	4
6	6	5
8+	6	6

SANITARY SEWER CLEANOUT

N.T.S.



SANITARY SEWER BEDDING

N.T.S.

GENERAL NOTES:

INLET PROTECTION DEVICES SHALL BE MAINTAINED OR REPLACED AT THE DIRECTION OF THE ENGINEER.

MANUFACTURED ALTERNATIVES APPROVED AND LISTED ON THE DEPARTMENT'S EROSION CONTROL PRODUCT ACCEPTABILITY LIST MAY BE SUBSTITUTED.

WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT SEDIMENT TRAPPED ON THE GEOTEXTILE FABRIC DOES NOT FALL INTO THE INLET. ANY MATERIAL FALLING INTO THE INLET SHALL BE REMOVED IMMEDIATELY.

1. FINISHED SIZE, INCLUDING FLAP POCKETS WHERE REQUIRED, SHALL EXTEND A MINIMUM OF 10" AROUND THE PERIMETER OF FACILITATE MAINTENANCE OR REMOVAL.
2. FOR INLET PROTECTION, TYPE "C" (WITH CURB BOX), AN ADDITIONAL 18" OF FABRIC IS WRAPPED AROUND THE WOOD AND SECURED WITH STAPLES. THE WOOD SHALL NOT BLOCK THE ENTIRE HEIGHT OF THE CURB BOX OPENING.
3. FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT A WOOD 2X4

INSTALLATION NOTES:

TYPE "B" & "C"

TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3 INCHES OF THE GRATE.

THE CONTRACTOR SHALL DEMONSTRATE A METHOD OF MAINTENANCE, USING A SEWN FLAP, HAND HOLDS OR OTHER METHODS TO PREVENT ACCUMULATED SEDIMENT FROM ENTERING THE INLET.

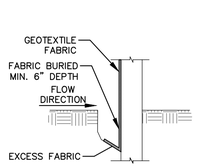
INSTALLATION NOTES:

TYPE "D"

DO NOT INSTALL INLET PROTECTION TYPE "D" IN INLETS SHALLOWER THAN 30 INCHES, MEASURED FROM THE BOTTOM OF THE INLET TO THE TOP OF THE GRATE.

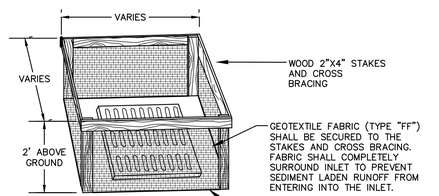
TRIM EXCESS FABRIC IN THE FLOW LINE TO WITHIN 3 INCHES OF THE GRATE.

THE INSTALLED BAG SHALL HAVE A MINIMUM SIDE CLEARANCE, BETWEEN THE INLET WALLS AND THE BAG, MEASURED AT THE BOTTOM OF THE OVERFLOW HOLES, OF 3 INCHES. WHERE NECESSARY THE CONTRACTOR SHALL CINCH THE BAG, USING PLASTIC ZIP TIES, TO ACHIEVE THE 3 INCHES CLEARANCE. THE TIES SHALL BE PLACED AT A MAXIMUM OF 4 INCHES FROM THE BOTTOM OF THE BAG.

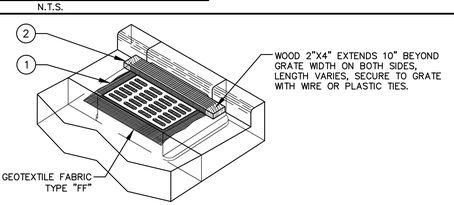


NOTE: 2' MINIMUM POST DEPTH. ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQUIRED IN UNSTABLE SOILS

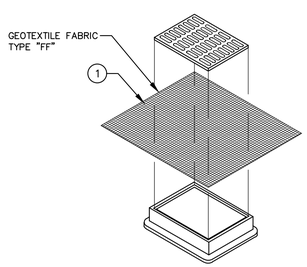
TRENCH DETAIL



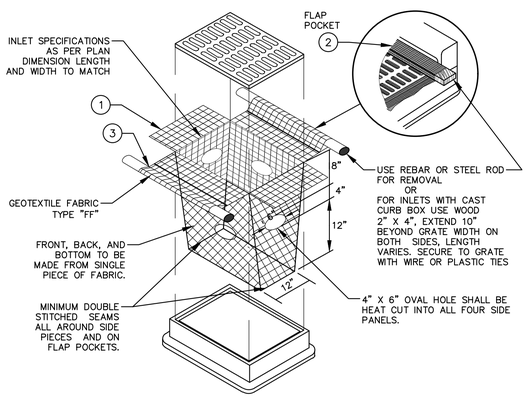
INLET PROTECTION – TYPE "A"



INLET PROTECTION – TYPE "C" WITH CURB BOX



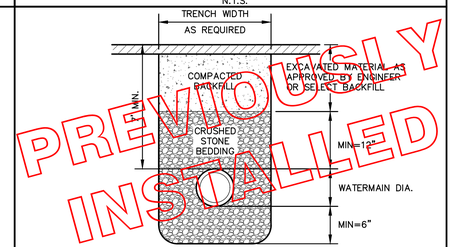
INLET PROTECTION – TYPE "B" WITHOUT CURB BOX



INLET PROTECTION – TYPE "D"

INLET PROTECTION

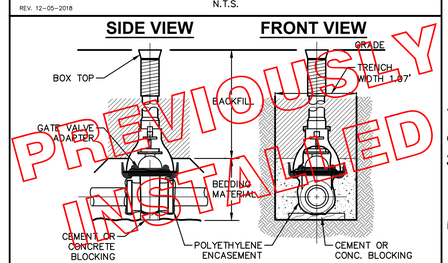
N.T.S.



WATERMAIN BEDDING

REV. 12-05-2018

N.T.S.



GATE VALVE BOX SETTING

REV. 12-04-2018

N.T.S.

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DETAILS

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YT	KCB

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1	06.30.2023	Bid & Permit Set

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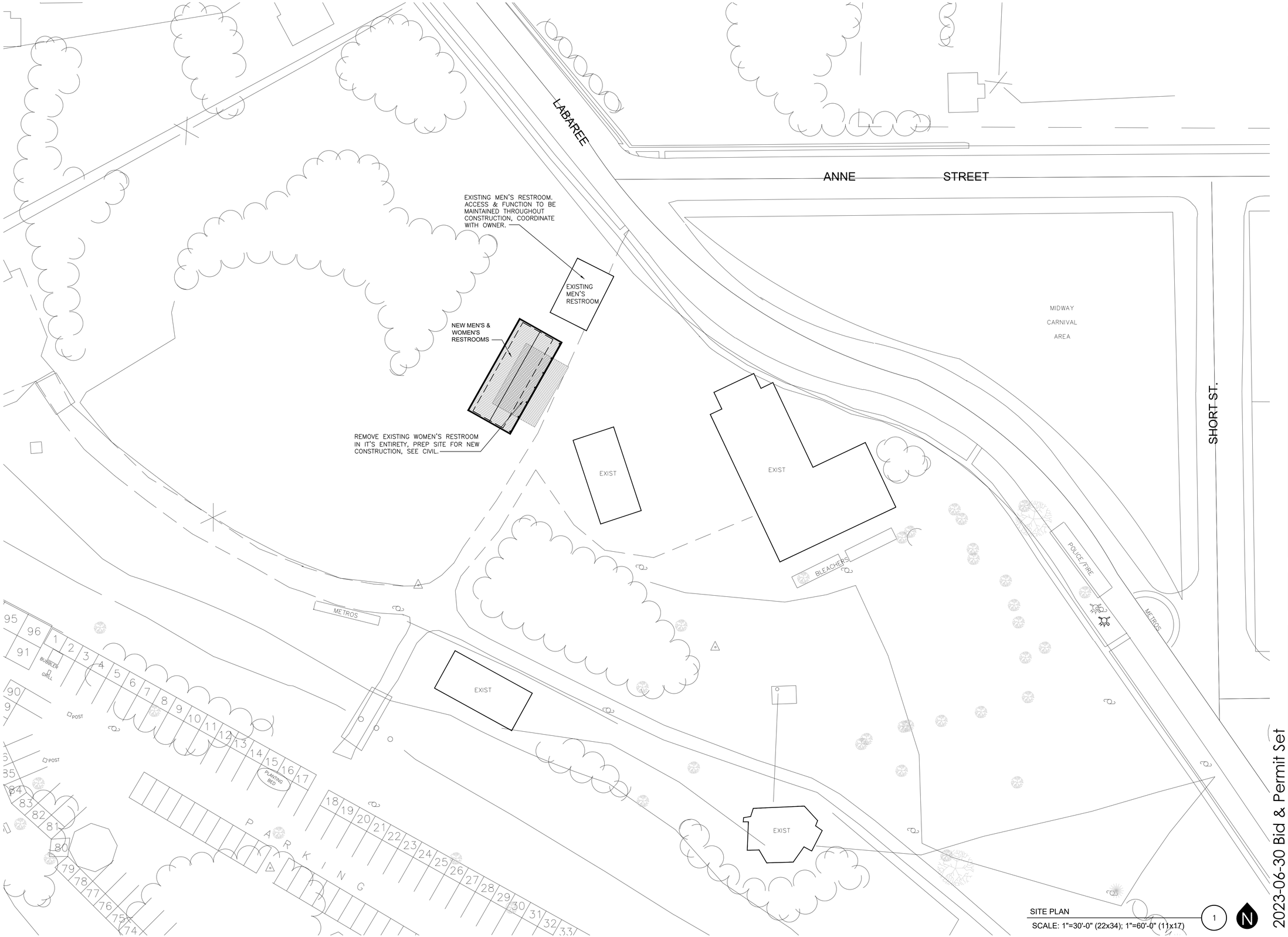
JSD
MILWAUKEE REGIONAL OFFICE
W238 N1610 BUSSE ROAD, SUITE 100
WAUKESHA, WISCONSIN 53188
P. 262.513.0666
JSD #21-11127

Sheet No.

C5.0



SITE PLAN

SCALE: 1"=30'-0" (22x34); 1"=60'-0" (11x17)

1

N

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Architect

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SITE PLAN

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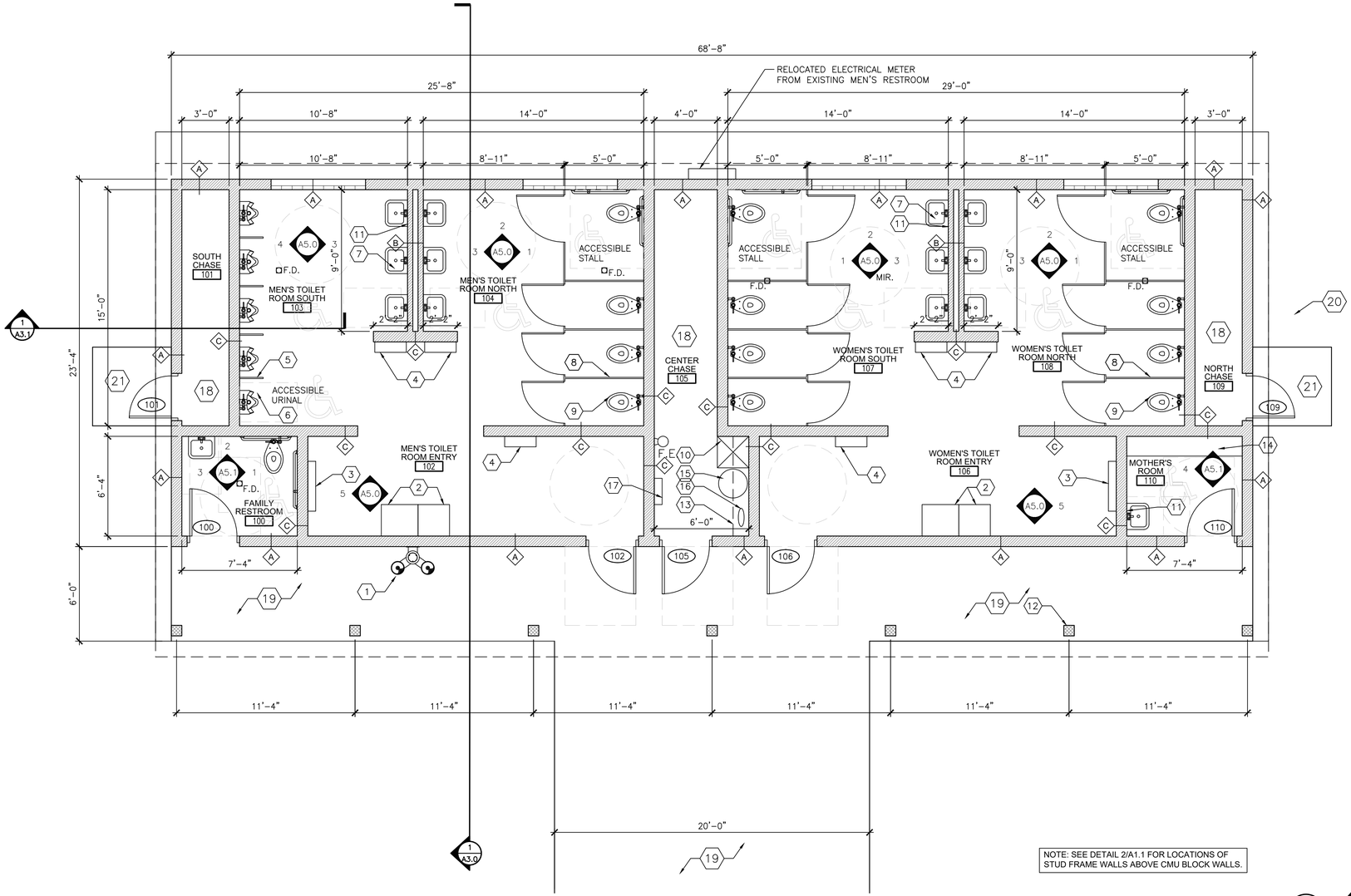
SP1.0

PLAN/EQUIP. KEY

1 DRINKING FOUNTAIN, BOTTLE FILLER	9 TOILET PARTITION	17 ELECTRICAL PANEL
2 TRASH RECEPTACLE	10 JANITOR'S SINK	18 PLUMBING CHASE
3 CHANGING STATION	11 MIRROR	19 CONCRETE SIDEWALK
4 HAND DRYER	12 COLUMN, SEE STRUCTURAL	20 GRAVEL MAINTENANCE STRIP
5 URINAL	13 SHELVING, BY OWNER	21 5X5 STOOP
6 URINAL PARTITION	14 BENCH SEAT	
7 LAVATORY	15 WATER HEATER	
8 TOILET	16 WATER METER	



NOTE: SEE DETAIL 2/A1.1 FOR LOCATIONS OF STUD FRAME WALLS ABOVE CMU BLOCK WALLS.

FLOOR PLAN
SCALE: 1/4"=1'-0" (22x34); 1/8"=1'-0" (11x17)

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FLOOR PLAN

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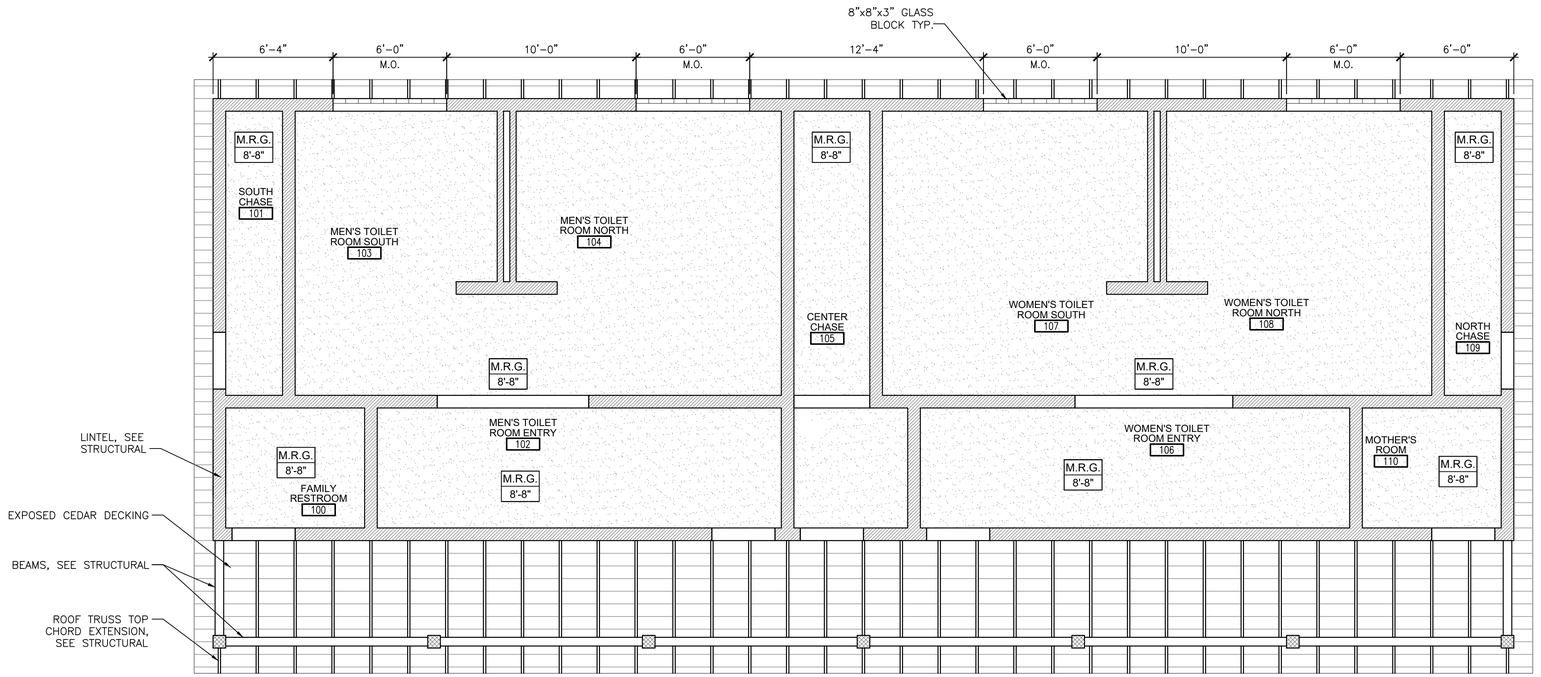

REFLECTED CEILING PLAN

SCALE: 1/4"=1'-0" (22x34); 1/8"=1'-0" (11x17)

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REFLECTED CEILING PLAN

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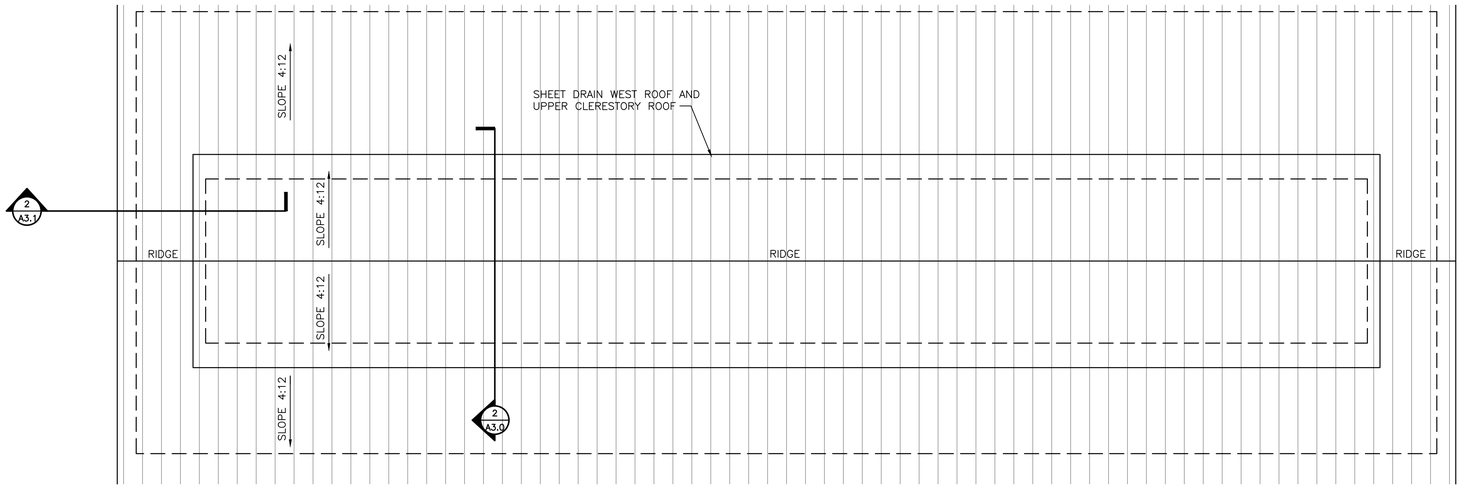
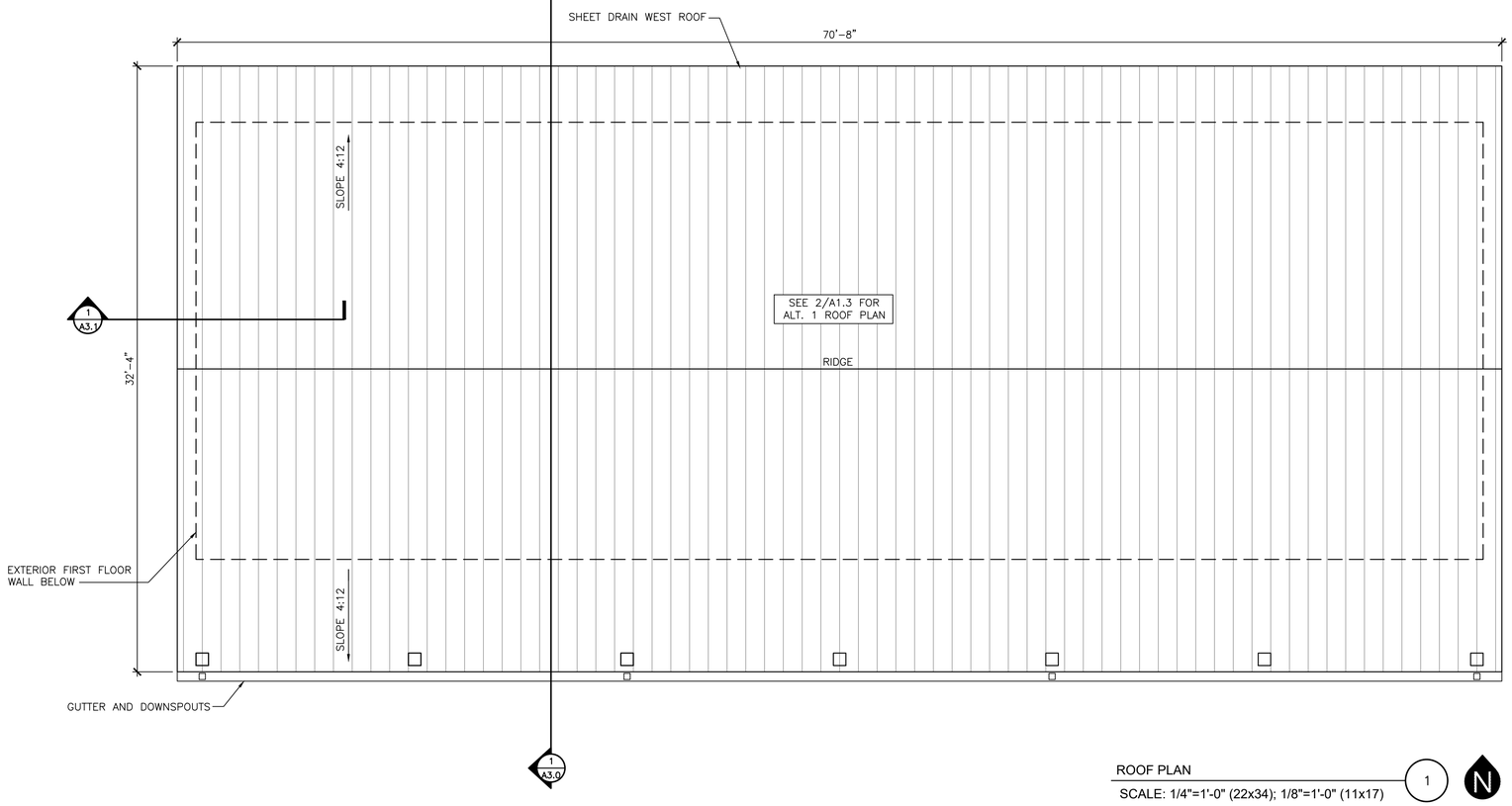
A1.2



ALTERNATE 1 ROOF PLAN
SCALE: 1/4"=1'-0" (22x34); 1/8"=1'-0" (11x17)

2

N



ROOF PLAN
SCALE: 1/4"=1'-0" (22x34); 1/8"=1'-0" (11x17)

1

N

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ROOF PLAN

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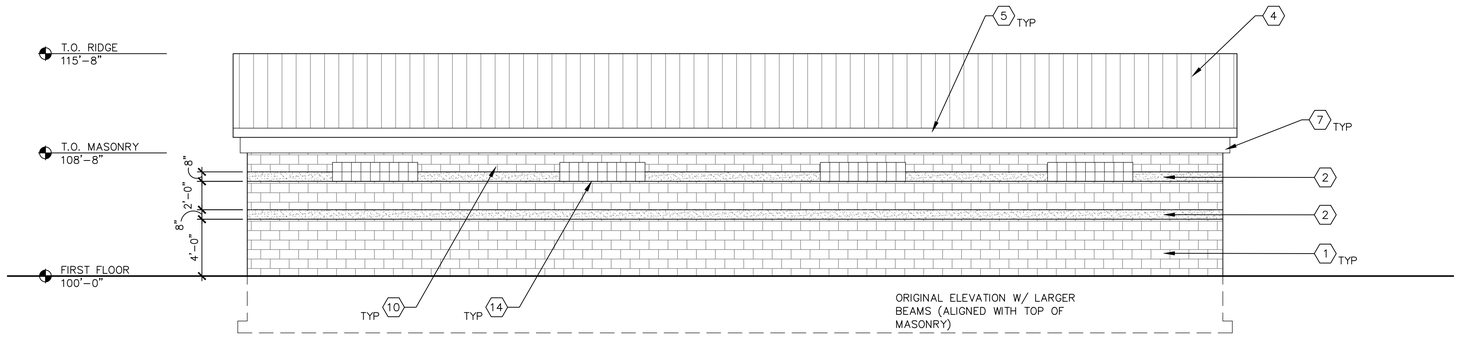
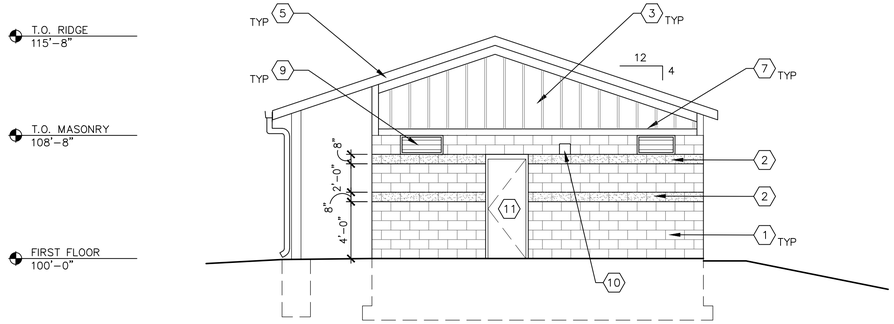
A1.3

KEY NOTES

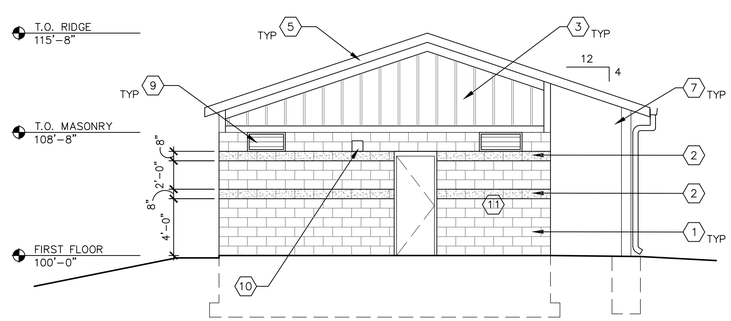
1. CMU SPLIT FACE BLOCK (FIELD) COLOR: NATURAL, MFG: COUNTY MATERIALS OR EQUAL.
2. CMU SMOOTH FACE BLOCK (ACCENT STRIPE) COLOR: STEEL GREY, MFG: COUNTY MATERIALS OR EQUAL.
3. BOARD & BATTEN LP SIDING COLOR: T.B.D.
4. BASE BID: STANDING SEAM ROOF COLOR: CHARCOAL, MFG: ATAS, OR EQUAL.
   ALTERNATE BID: ASPHALT SHINGLES COLOR: ESTATE GREY; MFG: OWENS CORNING DURATION OR EQUAL.
5. PREFINISHED ALUMINUM FASCIA, GUTTERS AND DOWNSPOUTS. COLOR: CHARCOAL GREY, MFG: ATAS, OR EQUAL.
6. WINDOW, FROSTED GLASS, 3M SECURITY FILM APPLIED, COMPOSITE TRIM, TO MATCH BOARD & BATTEN SIDING
7. CEDAR CLAD STRUCTURE
8. 12"x12" PREFINISHED VENT LOUVER, WITH INTERIOR MESH BUG SCREEN
9. EXHAUST / INTAKE LOUVER, COORDINATE WITH MECHANICALS; COLOR TO MATCH FIELD CMU.
10. WALL MOUNTED LIGHT FIXTURE, COORDINATE WITH ELECTRICAL.
11. HOLLOW METAL DOOR AND FRAME, PAINTED TO MATCH CMU FIELD COLOR.
12. HOLLOW METAL DOOR AND FRAME, PAINTED TO MATCH CMU ACCENT COLOR.
13. SIGNAGE.
14. 8"x8" GLASS BLOCK
15. DECORATIVE VENT



NORTH ELEVATION
SCALE: 3/16"=1'-0" (22x34); 3/32"=1'-0" (11x17) — 4

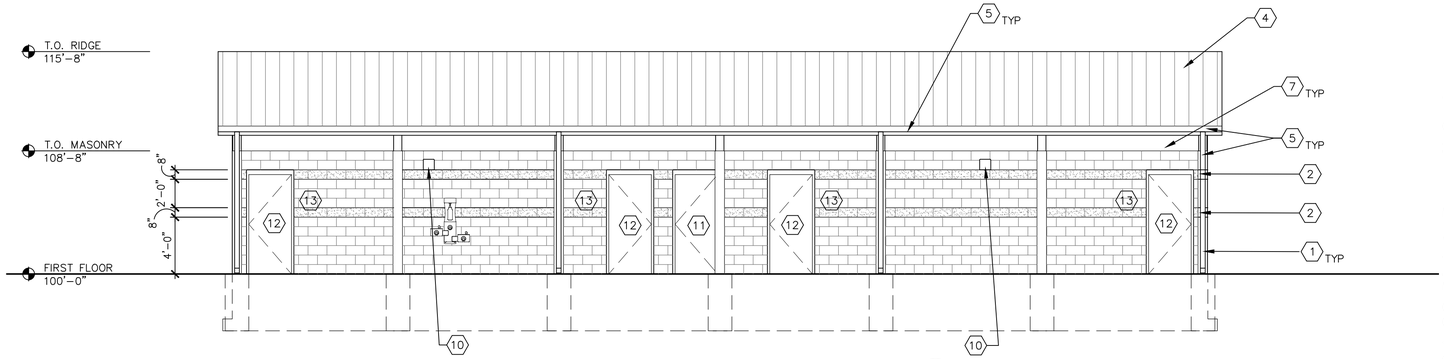


EAST ELEVATION
SCALE: 3/16"=1'-0" (22x34); 3/32"=1'-0" (11x17) — 3



WEST ELEVATION
SCALE: 3/16"=1'-0" (22x34); 3/32"=1'-0" (11x17) — 2

NOTE: SEE A2.1 FOR ALT. 1 ELEVATIONS



SOUTH ELEVATION
SCALE: 3/16"=1'-0" (22x34); 3/32"=1'-0" (11x17) — 1

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EXTERIOR ELEVATIONS

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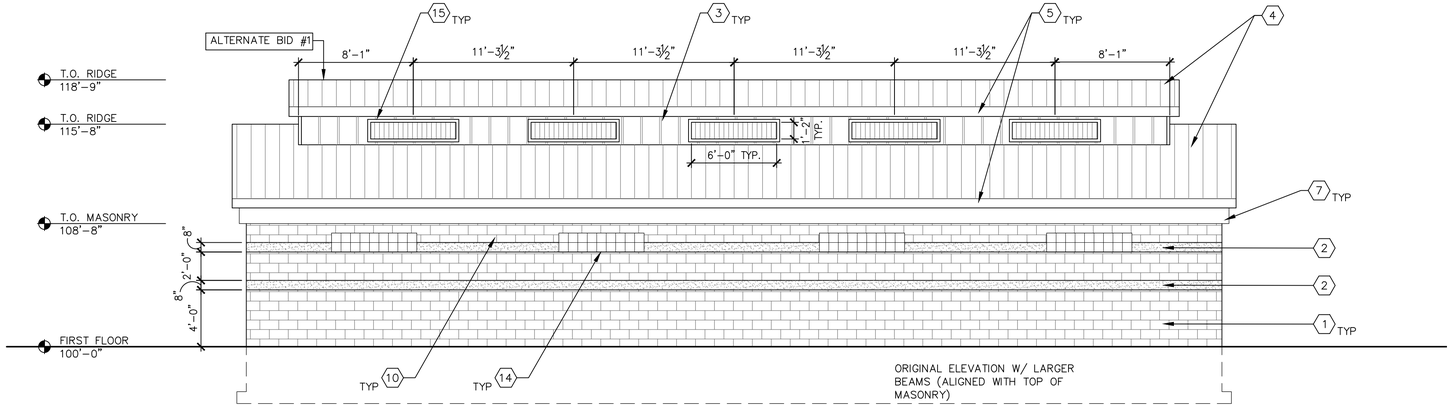
A2.0

KEY NOTES

1. CMU SPLIT FACE BLOCK (FIELD)
COLOR: NATURAL, MFG: COUNTY MATERIALS OR EQUAL.
2. CMU SMOOTH FACE BLOCK (ACCENT STRIPE)
COLOR: STEEL GREY, MFG: COUNTY MATERIALS OR EQUAL.
3. BOARD & BATTEN LP SIDING
COLOR: T.B.D.
4. BASE BID: STANDING SEAM ROOF
COLOR: CHARCOAL, MFG: ATAS, OR EQUAL.
ALTERNATE BID: ASPHALT SHINGLES
COLOR: ESTATE GREY; MFG: OWENS CORNING DURATION OR EQUAL.
5. PREFINISHED ALUMINUM FASCIA, GUTTERS AND DOWNSPOUTS.
COLOR: CHARCOAL GREY, MFG: ATAS, OR EQUAL.
6. WINDOW, FROSTED GLASS, 3M SECURITY FILM APPLIED. COMPOSITE TRIM, TO MATCH BOARD & BATTEN SIDING
7. CEDAR CLAD STRUCTURE
8. 12"x12" PREFINISHED VENT LOUVER, WITH INTERIOR MESH BUG SCREEN
9. EXHAUST / INTAKE LOUVER, COORDINATE WITH MECHANICALS; COLOR TO MATCH FIELD CMU.
10. WALL MOUNTED LIGHT FIXTURE, COORDINATE WITH ELECTRICAL.
11. HOLLOW METAL DOOR AND FRAME, PAINTED TO MATCH CMU FIELD COLOR.
12. HOLLOW METAL DOOR AND FRAME, PAINTED TO MATCH CMU ACCENT COLOR.
13. SIGNAGE.
14. 8"x8" GLASS BLOCK
15. FAUX DECORATIVE VENT



NORTH ELEVATION
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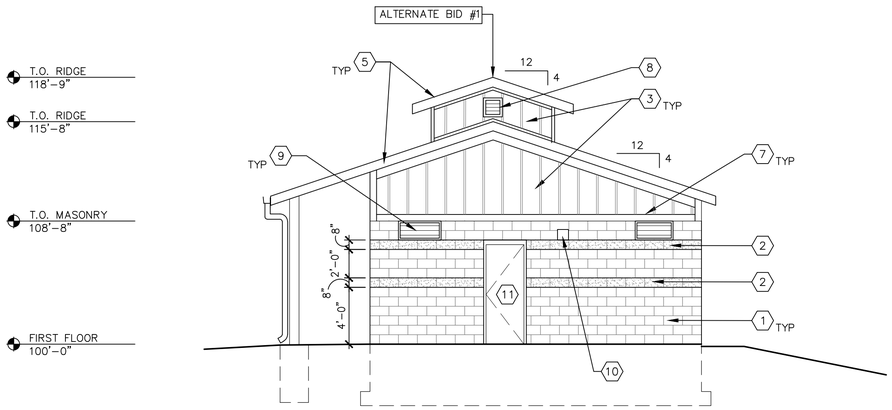

EAST ELEVATION
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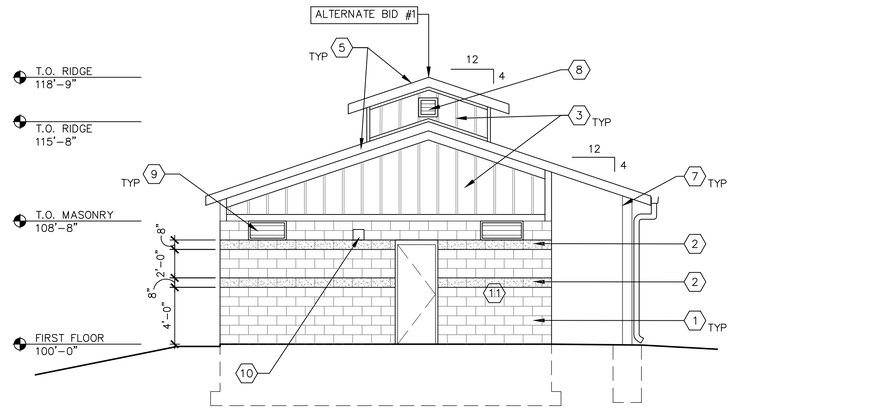

WEST ELEVATION
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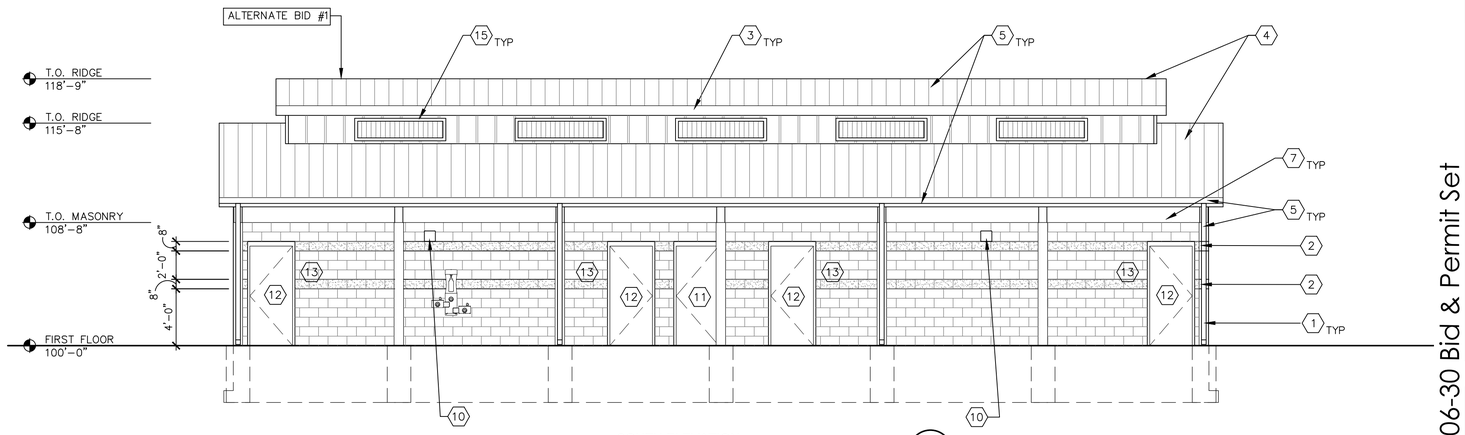
NOTE: SEE A2.0 FOR BASE BID ELEVATIONS



SOUTH ELEVATION
SCALE: 3/16"=1'-0" (22x34); 3/32"=1'-0" (11x17) 1

THRIVE ARCHITECTS
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ALTERNATE 1 EXTERIOR ELEVATIONS

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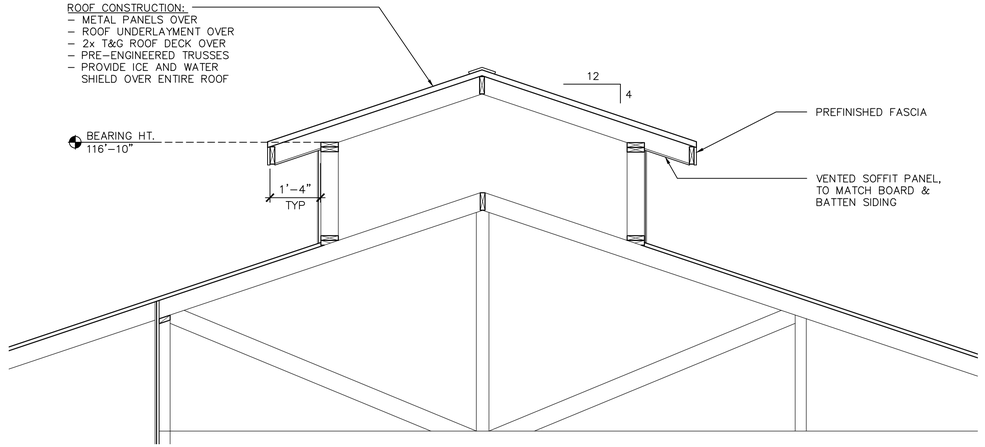
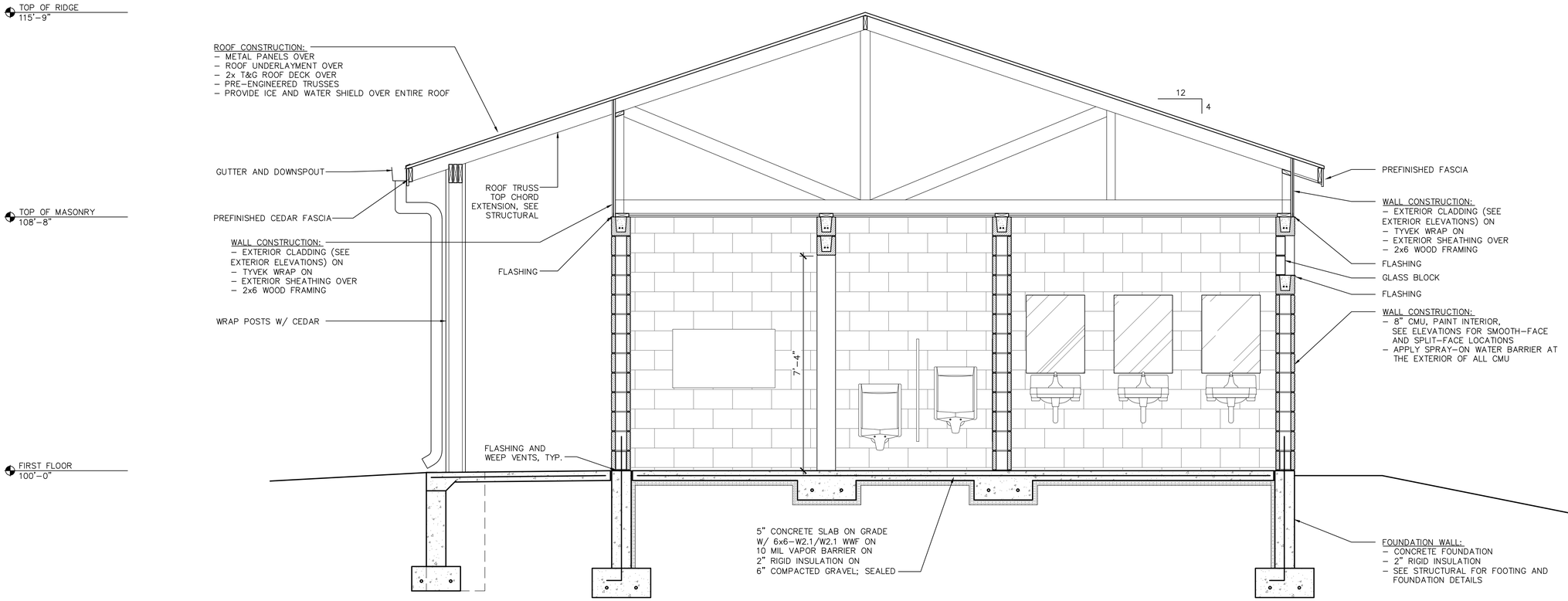
A2.1



ALTERNATE 1 BUILDING SECTION 2

SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)

SEE 2/A3.0 FOR ALT. 1 BUILDING SECTION



BUILDING SECTION 1

SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)

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BUILDING SECTIONS

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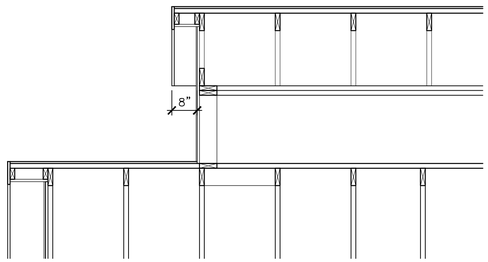
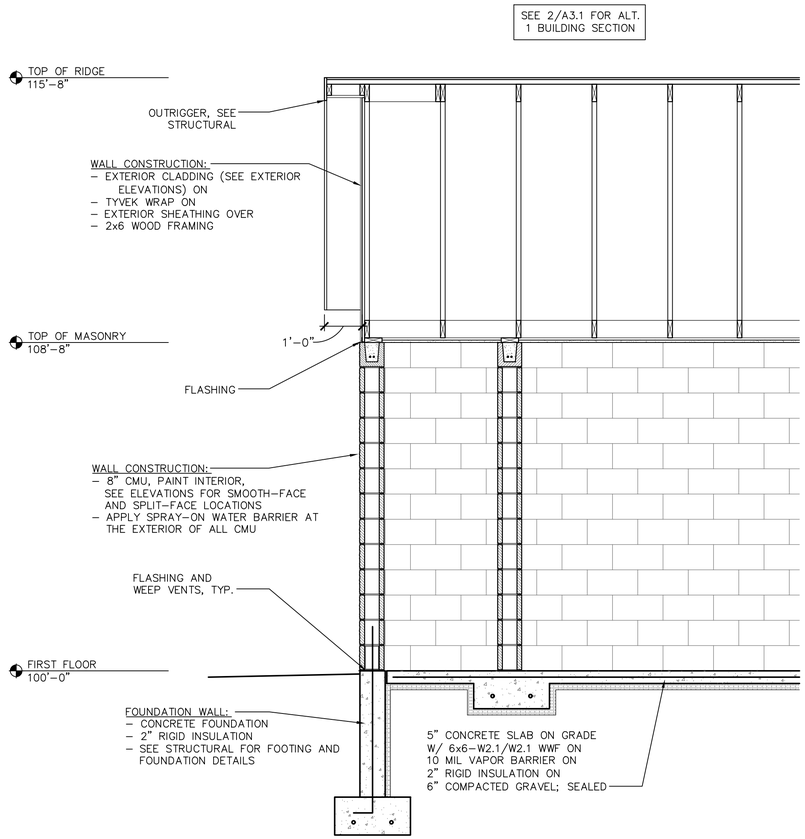
A3.0



ALTERNATE 1 BUILDING SECTION 2

SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)



BUILDING SECTION 1

SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)

THRIVE ARCHITECTS

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Watertown, WI

Sheet Title

BUILDING SECTIONS

Drawn by	Checked by
JAJ	DMR

Revisions

No.	Date	Description
	06.30.2023	Bid & Permit Set

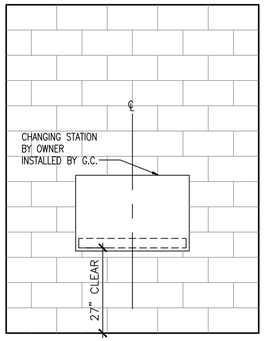
2023-06-30 Bid & Permit Set

Sheet No.

A3.1

NOTES:
1. SEE THE SPECIFICATIONS FOR ACCESSORIES SELECTIONS.

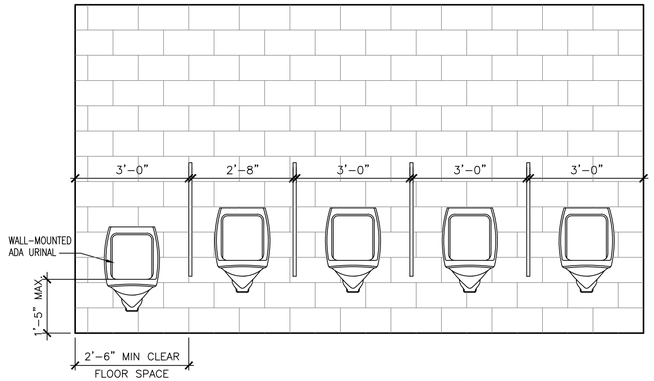
2. SEE THE PLUMBING FIXTURE SCHEDULE FOR TOILET, URINAL, AND LAVATORY SELECTIONS.



CHANGING STATION

SCALE: 1/2"=1'0"

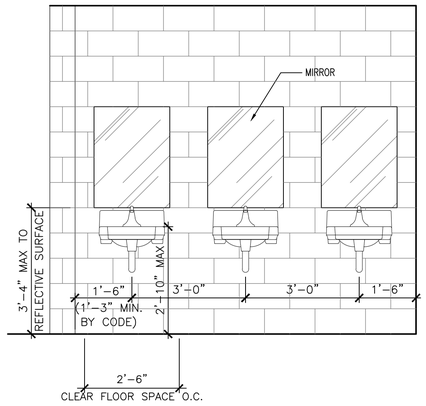
5



WATER CLOSET WALL

SCALE: 1/2"=1'0"

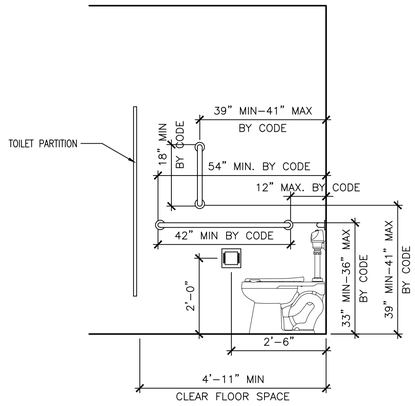
4



LAVATORY WALL

SCALE: 1/2"=1'0"

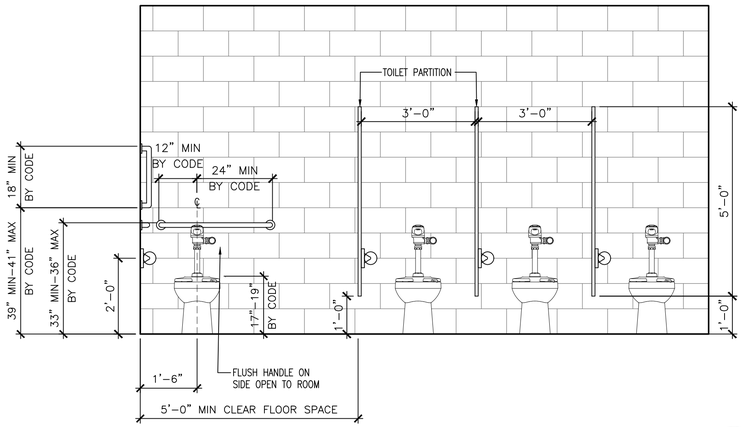
3



ADA TOILET STALL

SCALE: 1/2"=1'0"

2



WATER CLOSET WALL

SCALE: 1/2"=1'0"

1

THRIVE ARCHITECTS
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Project Info. — 22005

Riverside Park Restrooms

New Construction

600 Labaree St
Watertown, WI

Sheet Title

INTERIOR ELEVATIONS

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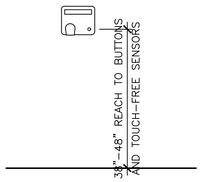
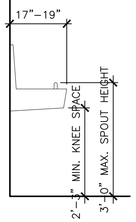
A5.0

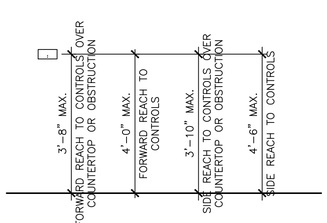
NOTES:
1. SEE THE SPECIFICATIONS FOR ACCESSORIES SELECTIONS.
2. SEE THE PLUMBING FIXTURE SCHEDULE FOR TOILET, URINAL, AND LAVATORY SELECTIONS.



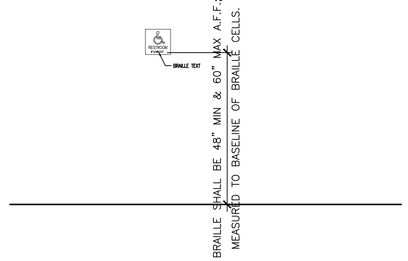
ACCESSIBLE HAND DRYER 8
SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)



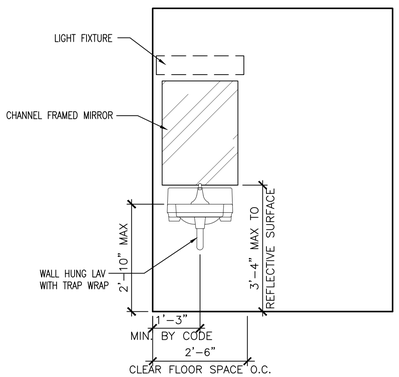
ACCESSIBLE DRINKING FOUNTAIN 7
SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)



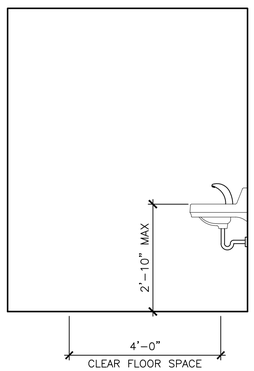
ACCESSIBLE SOAP DISPENSER 6
SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)



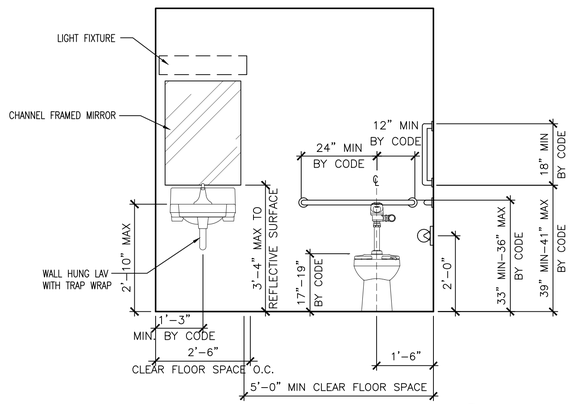
ACCESSIBLE TOILET ROOM SIGN 5
SCALE: 1/2"=1'-0" (22x34); 1/4"=1'-0" (11x17)



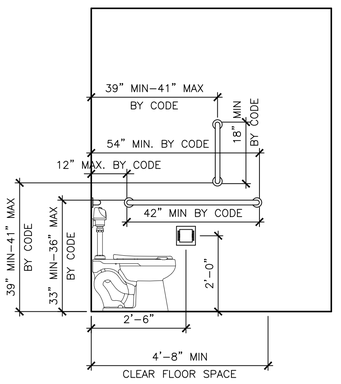
MOTHER'S ROOM 4
SCALE: 1/2"=1'0"



FAMILY RESTROOM 3
SCALE: 1/2"=1'0"



FAMILY RESTROOM 2
SCALE: 1/2"=1'0"



FAMILY RESTROOM 1
SCALE: 1/2"=1'0"

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Project Info. — 22005
Riverside Park Restrooms
New Construction
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Watertown, WI

Sheet Title
INTERIOR ELEVATIONS

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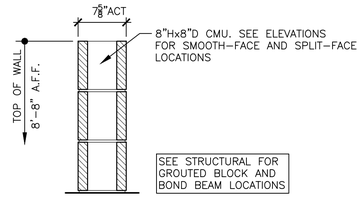
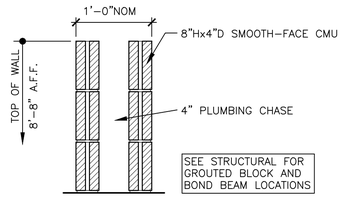
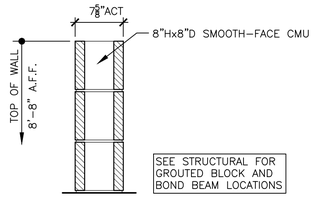
Sheet No.
A5.1



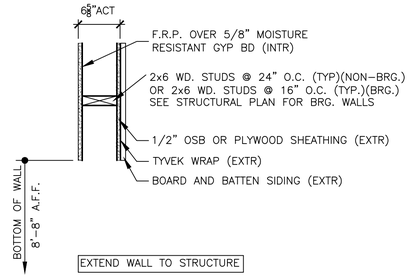
WALL TYPE A



WALL TYPE B

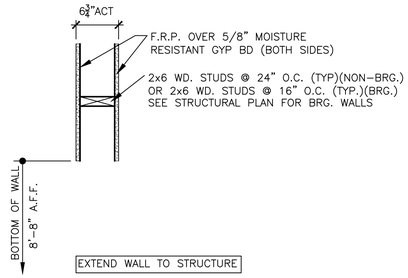


WALL TYPE C



WALL TYPE D

NOTE: SEE DETAIL 2/A1.1 FOR LOCATIONS OF STUD FRAME WALLS ABOVE CMU BLOCK WALLS.

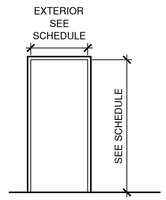


WALL TYPE E

NOTE: SEE DETAIL 2/A1.1 FOR LOCATIONS OF STUD FRAME WALLS ABOVE CMU BLOCK WALLS.

FRAME TYPES

F1

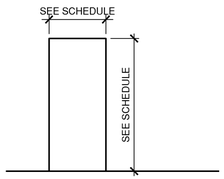


FRAME: HOLLOW METAL
TRIM: NONE
FINISH: PAINTED

DOOR TYPES

D1

EXTERIOR



THICKNESS: 1-3/4"
MATERIAL: HOLLOW METAL
PANEL: FLUSH
FINISH: PAINTED
GLAZING: NONE
HARDWARE: SEE DOOR SCHEDULE NOTES

DOOR SCHEDULE

DOOR NUMBER	ROOM NAME	NO. OF PANELS	SIZE		DOOR TYPE	FRAME TYPE	FIRE RATING	REMARKS
			WIDTH	HEIGHT				
100	FAMILY RESTROOM	1	3'-0"	7'-0"	D1	F1		HG1
101	SOUTH CHASE	1	2'-8"	7'-0"	D1	F1		HG2
102	MEN'S TOILET ROOM ENTRY	1	3'-0"	7'-0"	D1	F1		HG1
105	CENTER CHASE	1	3'-0"	7'-0"	D1	F1		HG2
106	WOMEN'S TOILET ROOM ENTRY	1	3'-0"	7'-0"	D1	F1		HG1
109	NORTH CHASE	1	2'-8"	7'-0"	D1	F1		HG2
110	MOTHER'S ROOM	1	3'-0"	7'-0"	D1	F1		HG1

NOTES:

1. G.C. TO SUPPLY ALL DOOR HARDWARE REQUIRED BY CODE.
2. DOOR HARDWARE SHALL COMPLY WITH ICC/ANSI A117.1 SEC 404.2.6 – HANDLES, PULLS, LATCHES, LOCKS, AND OTHER OPERABLE PARTS ON ACCESSIBLE DOORS SHALL HAVE A SHAPE THAT IS EASY TO GRASP WITH ONE HAND AND DOES NOT REQUIRE TIGHT GRASPING, PINCHING OR TWISTING OF THE WRIST. THE HARDWARE SHALL BE PLACED AT LEAST 34 INCHES, BUT NOT MORE THAN 48 INCHES ABOVE THE FLOOR SURFACE.
3. COORDINATE REQUIREMENTS OF ELECTRONIC STRIKE WITH OWNER FOR REMOTE/TIMED ACCESS TO PUBLIC DOORS.

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Project Info. — 22005

Riverside Park Restrooms

New Construction

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Watertown, WI

Sheet Title

DOOR, WALL TYPES AND SCHEDULES

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Revisions

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Sheet No.

A6.0

EXHAUST FANS (EF)

TYPE MARK	MARK	MANUFACTURER	MODEL	SERVICE	LOCATION	DRIVE	AIRFLOW (CFM)	ESP (IN WC)	RPM	BACKDRAFT DAMPER	MOTOR		UNIT ELECTRICAL			WEIGHT (LBS)	SONES	REMARKS
											HP	BHP	VOLTS / PH	STARTER	DISCONNECT			
EF	1	GREENHECK	SQ-100-VG	WOMENS REST ROOM	IN JOIST SPACE	DIRECT	600	0.25	985	MOTORIZED	1/4	0.04	120 / 1Ø	MANUAL	BY MANUFACTURER	45	4.3	1
EF	2	GREENHECK	SQ-100-VG	MENS REST ROOM	IN JOIST SPACE	DIRECT	675	0.25	1046	MOTORIZED	1/4	0.05	120 / 1Ø	MANUAL	BY MANUFACTURER	45	5.0	1
EF	3	GREENHECK	SP-80-VG	FAMILY REST ROOM	CEILING SUSPENDED	DIRECT	75	0.25	935	-	-	-	120 / 1Ø	MANUAL	BY MANUFACTURER	12	0.3	1
EF	4	GREENHECK	SP-80-VG	JANITOR'S CLOSET	CEILING SUSPENDED	DIRECT	75	0.25	935	-	-	-	120 / 1Ø	MANUAL	BY MANUFACTURER	12	0.3	1
EF	5	GREENHECK	SP-80-VG	MOTHER'S ROOM	CEILING SUSPENDED	DIRECT	75	0.25	935	-	-	-	120 / 1Ø	MANUAL	BY MANUFACTURER	12	0.3	1

1. FAN TO BE PROVIDED WITH ECM ADJUSTABLE SPEED MOTOR. PROVIDE ADJUSTABLE SPEED DIAL IN AN ACCESSIBLE LOCATION ON FAN.

LOUVER

MARK	MANUFACTURER	MODEL	LOCATION	SERVICE	CONSTRUCTION		CFM	SIZE			MAX FREE AREA VELOCITY - FPM	MAX PRESSURE DROP - IN WC	REMARKS
					TYPE	MATERIAL		LENGTH	WIDTH	DEPTH			
L-1	GREENHECK	ESD-403	SEE PLANS	WOMENS REST ROOM	FASTENED	ALUMINUM	750	26"	16"	6"	649	0.1	1, 2, 3
L-2	GREENHECK	ESD-403	SEE PLANS	MENS REST ROOM	FASTENED	ALUMINUM	750	26"	16"	6"	649	0.1	1, 2, 3
L-3	GREENHECK	ESD-202	SEE PLANS	WOMENS REST ROOM	FASTENED	ALUMINUM	625	26"	16"	6"	700	0.1	1, 2, 3
L-4	GREENHECK	ESD-403	SEE PLANS	MENS REST ROOM	FASTENED	ALUMINUM	700	26"	16"	6"	606	0.1	1, 2, 3

1. COORDINATE COLOR WITH ARCHITECT
2. PROVIDE WITH INSECT SCREEN
3. LOUVERS WILL BE PROVIDED BY THE GENERAL CONTRACTOR UNDER DIVISION 08 90 00. THE SELECTIONS ABOVE ARE FOR MECHANICAL PERFORMANCE CRITERIA ONLY.

DIFFUSERS AND GRILLES

MARK	MANUFACTURER	MODEL	TYPE	SERVICE	MATERIAL	CONFIGURATION			FINISH	REMARKS
						BLADES		MOUNTING / FRAME		
						SPACING (IN)	ANGLE			
S1	TITUS	TMR	ROUND CONICAL	SUPPLY	STEEL	-	-	LAY-IN	WHITE	1
E1	TITUS	350FL	SINGLE DEFLECTION	EXHAUST	STEEL	3/4"	35°	LAY-IN	WHITE	1

NOTE: SEE PLANS FOR NECK SIZES

1. ARCHITECT TO COMFIRM COLOR SELECTION

Sequence of Operation: Exhaust fans and motor operated control dampers

Note: All exhaust fans will take an occupancy input from the lighting system. In all cases the fan shall receive an occupied signal from the associated zone lighting occupancy sensor. The method of delivery of the occupancy status from the lighting system may vary slightly from zone to zone. If there is no occupancy sensor in a specific zone or space then the exhaust fan operation should be indexed to turn on and off in sequence with the manual light switch in that room or zone.

Lighting System Interface:
The lighting occupancy sensor shall send a signal from the auxiliary contact of the occupancy sensor to the HOA controller of inline exhaust fans EF-1 and EF-2. Fans should be programmed to run for 10 minutes after the lighting occupancy sensor has turned off the lights to facilitate adequate removal of odors. If communication is lost with the lighting system, the exhaust fan shall continue to operate until the programmed time out of 10 minutes after the room has switched to unoccupied mode.

The lighting occupancy sensor shall send a direct 0-10V signal from the auxiliary contact of the occupancy sensor directly to the ECM motor of ceiling mounted exhaust fans EF-3 and EF-5. Fans should operate when lighting is on and turn off when lighting occupancy sensors times out, switching the room to an unoccupied set point. This timeout shall be no longer than 30 minutes.

Ceiling mounted EF-4 shall be controlled directly by the manual light switch in the Janitor's Closet.

Occupancy Mode: The occupancy mode shall be communicated to each exhaust fan via a binary input. Valid Occupancy modes for the exhaust fans shall be:

Occupied: Normal operating mode for occupied spaces during normal operation. When the lighting sensor is in the occupied mode the associated exhaust fan shall be energized and shall maintain the scheduled space airflow. When a fan is energized the associated motorized dampers shall open.

Unoccupied Standby: Mode used for unoccupied spaces. The occupancy sensor integral to the lighting system shall be used to indicate that the space is occupied or unoccupied. In the standby mode the exhaust fan airflow setpoint will be reduced to the minimum CFM, scheduled for 0 CFM. When the fan enters unoccupied mode the motor shall shut off and the associated motorized dampers shall close.

Motorized Dampers: Each fan shall be provided with a motorized control damper. Control dampers are intended to prevent backflow of outdoor air into the exhaust system when the system is de-energized.

Exhaust: Each exhaust fan will have an associated motorized control damper. When the fan is energized the associated motorized damper shall open. The damper shall close when the fan shuts off. Actuators shall be selected so that these motorized exhaust dampers fail open.

Intakes: Each outdoor air louver will have an associated motorized control damper. When any one of the associated exhaust fans are energized that the associated motorized damper at the intake louver shall open. The intake damper shall close when all associated exhaust dampers prove closed. Actuators shall be selected so that motorized intake dampers fail closed.

Heating Control:
Heat is not provided by this system. The intent is that the domestic water systems will be shut off and drained in advance of freezing or sub-freezing conditions.

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AP	ACCESS PANEL
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
CA	COMBUSTION AIR
COND	CONDENSATE DRAIN
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CR	LOW PRESSURE STEAM CONDENSATE RETURN
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
DE	DISHWASHER EXHAUST
DN	DOWN
EA	EXHAUST AIR
GSHXR	GROUND SOURCE HEAT EXCHANGER RETURN
GSHXS	GROUND SOURCE HEAT EXCHANGER SUPPLY
HPS	HIGH PRESSURE STEAM
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
KE	KITCHEN EXHAUST
LPS	LOW PRESSURE STEAM
MPS	MEDIUM PRESSURE STEAM
NC	NORMALLY CLOSED
NG	NATURAL GAS
NO	NORMALLY OPEN
OA	OUTSIDE AIR
RA	RETURN AIR
RCOVR	ENERGY RECOVERY RETURN
RCOVS	ENERGY RECOVERY SUPPLY
RELF	RELIEF AIR
RL	REFRIGERATION LIQUID
RS	REFRIGERATION SUCTION
SA	SUPPLY AIR
SOLR	SOLAR THERMAL RETURN
SOLS	SOLAR THERMAL SUPPLY
TA	TRANSFER AIR
VFD	VARIABLE FREQUENCY DRIVE
X	EXISTING

HVAC LEGEND

- NEW HVAC EQUIPMENT
- NEW DUCTWORK
- EXISTING MECHANICAL COMPONENT
- DEMOLISHED MECHANICAL COMPONENT
- MECHANICAL EQUIPMENT SERVICE AREA
- (M##) KEY NOTE
- SUPPLY AIR DUCT UP
- SUPPLY AIR DUCT DOWN
- RETURN AIR DUCT UP
- RETURN AIR DUCT DOWN
- OUTSIDE AIR DUCT UP
- OUTSIDE AIR DUCT DOWN
- EXHAUST AIR DUCT UP
- EXHAUST AIR DUCT DOWN
- ELBOW WITH TURNING VANES
- FLEX DUCT
- M — MOTORIZED DAMPER
- BD — BACK DRAFT DAMPER
- FD — FIRE DAMPER
- SD — SMOKE DAMPER
- FSD — COMBINATION FIRE/SMOKE DAMPER
- XX-1 — DAMPER WITH SEQUENCING NUMBER
- BALANCING DAMPER
- AIR FLOW INDICATOR
- UC — DOOR UNDER CUT
- TRANSFER/DOOR GRILLE
- S-* NEW SUPPLY DIFFUSER
- R-*/T-* NEW RETURN/TRANSFER GRILLE
- E-* NEW EXHAUST GRILLE
- C — CO2 SENSOR
- PD — PRESSURE DIFFERENTIAL SENSOR
- SP — STATIC PRESSURE CONTROLLER
- T — THERMOSTAT
- T — TEMPERATURE SENSOR
- TC — THERMOSTAT /CO2 SENSOR
- TC — TEMPERATURE /CO2 SENSOR
- $ — WALL SWITCH
- CONTROL WIRE
- POINT OF CONNECTION
- DN — DUCT OFFSET
- EQUIPMENT / RTU X-X / FLOOR TAG — HVAC EQUIPMENT TAG ELECTRICALLY POWERED
- EQUIPMENT / VAV X-X / FLOOR TAG — HVAC EQUIPMENT TAG NOT ELECTRICALLY POWERED
- NECK SIZE / A1 XX"xXX" CFM / TAG TYP. # — DIFFUSER/GRILLE TAG

GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL REQUIRED OFFSETS FOR A COMPLETE INSTALLATION. CONTRACTOR SHALL INSTALL MATERIAL AND EQUIPMENT TO CONFORM TO THE STRUCTURE, EQUIPMENT CONNECTIONS AND SHALL MAINTAIN APPROPRIATE CLEARANCES.
2. ALL WORK SHALL COMPLY WITH APPLICABLE NATIONAL, STATE, LOCAL CODES, FEDERAL AND STATE REGULATIONS, AND ALL REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION.
3. CONTRACTOR SHALL COORDINATE WORK WITH ALL OTHER TRADES PRIOR TO INSTALLATION.
4. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE THE FULL EXTENT OF WORK AND PROJECT CONDITIONS. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF THE OBLIGATIONS OF THE CONTRACT.
5. COORDINATE EXACT LOCATION OF CEILING DIFFUSERS AND GRILLES WITH REFLECTED CEILING PLAN.
6. ALL BRANCH DUCTS SHALL MATCH DIFFUSER NECK SIZES UNLESS OTHERWISE NOTED.
7. ALL CONTROL WIRING SHALL BE RUN IN CONDUIT.
8. KEYNOTES PERTAIN ONLY TO THE DRAWING THEY ARE LOCATED ON.
9. DUCT SIZES ARE CLEAR INSIDE DIMENSIONS.
10. ALL HOT WATER BRANCH LINES ARE 3/4" UNLESS NOTED OTHERWISE.
11. MAINTAIN 10' MINIMUM DISTANCE FROM OUTSIDE AIR INTAKE TO ANY EXHAUST OR PLUMBING VENTS.
12. FLEXIBLE DUCTWORK SHALL NOT EXCEED 5'-0" IN LENGTH.
13. ALL SUPPLY AND RETURN DUCTWORK IN UNINSULATED ATTIC SPACE SHALL BE WRAPPED WITH 3" INSULATION.
14. CLEAN ALL EXISTING DUCTWORK, COILS AND DIFFUSERS DESIGNATED TO REMAIN WITHIN THE PROJECT'S SCOPE OF WORK.
15. REMOVAL AND REINSTALLATION OF EXISTING CEILING IS REQUIRED. REPLACE ALL DAMAGED CEILING WITH NEW, EQUAL TO EXISTING.

MECHANICAL SHEET INDEX

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Watertown, WI

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MECHANICAL NOTES, LEGEND, AND ABBREVIATIONS

Drawn by	Checked by

Revisions

No.	Date	Description
	06.30.2023	Bid & Permit Set

WISCONSIN
COLLEEN M. HOFFMANN
40740
NEW BERLIN
WIS.
PROFESSIONAL ENGINEER
7/31/2024
EXP 7/31/2024

ibc engineering services, inc.

2023-06-30 Bid & Permit Set

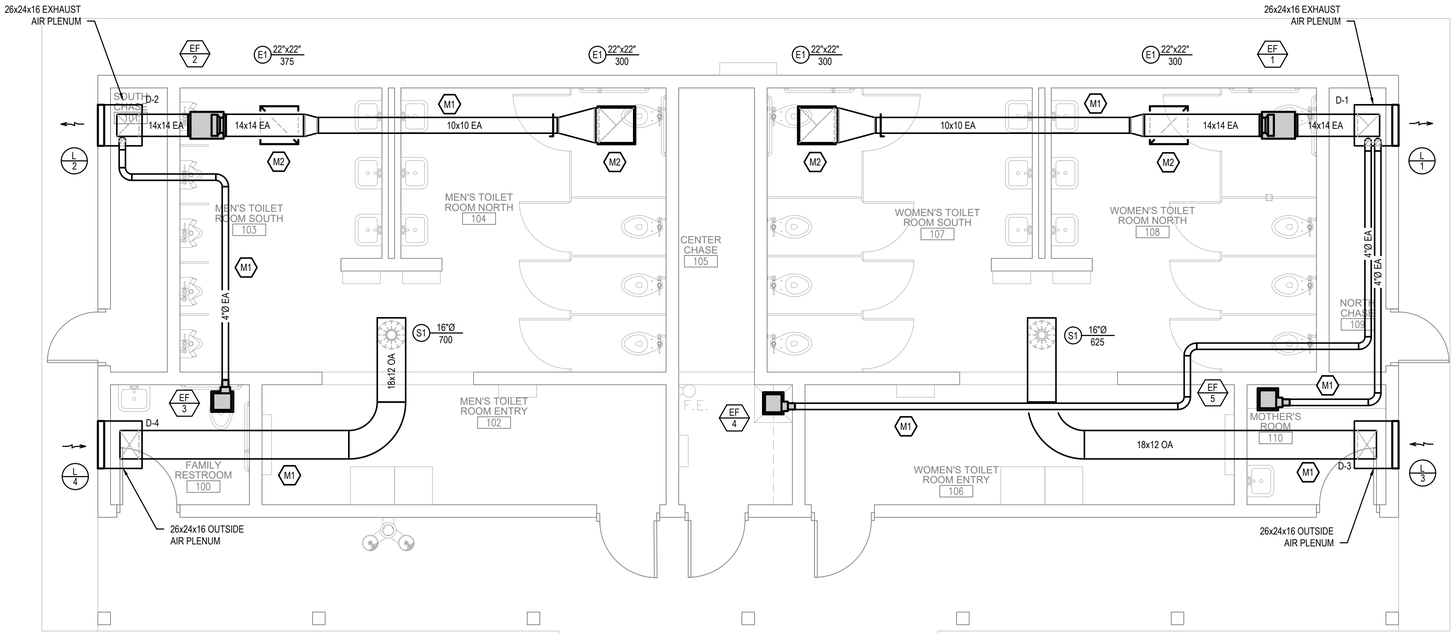
Sheet No.

M0.1

THIS BAR APPEARS 2" LONG ON FULL SIZE SHEETS.

KEY NOTES

M1	ROUTE DUCT UP AND INTO JOIST SPACE.
M2	CONTRACTOR TO ADD BALANCING DAMPERS FOR EACH GRILLE.



1 MECHANICAL FLOOR PLAN
SCALE: 1/4" = 1'-0"

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259 South Street, Suite A
WAUKESHA, WI 53186
p: 833-380-6180

Project Info. — 22005

Riverside Park Restrooms

New Construction

600 Labaree St
Watertown, WI

Sheet Title

MECHANICAL FLOOR PLAN

Drawn by	Checked by

Revisions

No.	Date	Description
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THIS BAR APPEARS 2" LONG ON FULL SIZE SHEETS.

ABBREVIATIONS

AC	ALTERNATING CURRENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AMPERE INTERRUPTING CAPACITY
ALT	ALTERNATE
AMP	AMPERE
AOR	AREA OF REFUGE
AORM	AREA OF REFUGE MASTER STATION
AORR	AREA OF REFUGE REMOTE STATION
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AV	AUDIO VISUAL
BLDG	BUILDING
BOT	BOTTOM
C	CONDUIT
CAB	CABINET
CATV	COMMUNITY ANTENNA TELEVISION
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CD	CANDELA OR CONSTRUCTION DOCUMENT
CKT	CIRCUIT
CLG	CEILING
COAX	COAXIAL CABLE
CP	CONTROL PANEL
CT	CURRENT TRANSFORMER
CU	COPPER
dB	DECIBEL
DB	DIRECT BURIAL
DEMO	DEMOLITION
DISC	DISCONNECT
DIST	DISTRIBUTION
DM	DIMMING
DN	DOWN
DPDT	DOUBLE POLE, DOUBLE THROW
DPST	DOUBLE POLE, SINGLE THROW
DS	DAYLIGHT SENSOR
DWG	DRAWING
EBU	EMERGENCY BATTERY UNIT
EC	ELECTRICAL CONTRACTOR
ELEV	ELEVATOR
EM	EMERGENCY
ENCL	ENCLOSURE
ER	ELEVATOR RECALL
ERL	EXISTING TO BE RELOCATED
ES	ELECTRIC STRIKE
ETR	EXISTING TO REMAIN
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FC	FOOT-CANDLE
FLA	FULL LOAD AMPERE
FP	FIRE PROTECTION
FSS	FUSED SAFETY SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
GEN	GENERATOR
GRD	GROUND
GC	GENERAL CONTRACTOR
GFI / GFCI	GROUND FAULT CIRCUIT INTERRUPTER
HID	HIGH INTENSITY DISCHARGE
HOA	HAND-OFF-AUTO
HP	HORSE POWER
HZ	HERTZ
IG	INSOLATED GROUND
K	KEY OPERATED
JB	JUNCTION BOX
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT
KWH	KILOWATT HOUR
LCP	LIGHTING CONTROL PANEL
LED	LIGHT EMITTING DIODE
LF	LINEAR FOOT (FEET)
LM	LUMEN
LPS	LOW PRESSURE SODIUM
LRA	LOCKED ROTOR AMPERAGE
LTG	LIGHTING
LV	LOW VOLTAGE
MAG	MAGNETIC STARTER
MAN	MANUAL STARTER
MATV	MASTER ANTENNA TELEVISION SYSTEM
MC	MECHANICAL CONTRACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCB	MAIN CIRCUIT BREAKER
MFG	MANUFACTURER
MH	MANHOLE
MOCP	MAXIMUM OVERCURRENT PROTECTION
MLO	MAIN LUG ONLY
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
MV	MEDIUM VOLTAGE
N	NEUTRAL
NA	NOT APPLICABLE
NAC	NOTIFICATION APPLIANCE CIRCUIT
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NFPA	NATIONAL FIRE PROTECTION AGENCY
NFSS	NON-FUSED SAFETY SWITCH
NIC	NOT INCLUDED IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OL	OVERLOAD
OS	OPTIONAL STANDBY
P	POLE
PA	PUBLIC ADDRESS
PB	PUSHBUTTON
PC	PLUMBING CONTRACTOR
PE	PHOTOELECTRIC CELL, PHOTOEYE
PED	PEDESTAL
PEND	PENDANT
PF	POWER FACTOR
PH	PHASE
PL	PILOT LIGHT
PNL	PANEL
PWR	POWER
RC	REMOTE CONTROL
RCP	REFLECTED CEILING PLAN
REC	RECESSED
RECPT	RECEPTACLE
SCC	SHORT CIRCUIT CAPACITY
SF	SQUARE FOOT (FEET)
SPD	SURGE PROTECTION DEVICE
SPEC	SPECIFICATION
SPST	SINGLE POLE, SINGLE THROW
SS	SWITCH STATION
SW	SWITCH
T	TAMPERPROOF
TC	TIMECLOCK
TV	TELEVISION
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
TYP	TYPICAL
UL	UNDERWRITERS LABORATORY
UNV	UNIVERSAL
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VA	VOLT AMPERE
VAC	VOLT AMPERE CURRENT
VFD	VARIABLE FREQUENCY DRIVE
W	WATT OR WIRE
WAP	WIRELESS ACCESS POINT
WP	WEATHERPROOF
X-	EXISTING
XFER	TRANSFER
XFMR	TRANSFORMER

LIGHTING LEGEND

- $ — SWITCH
- SS — SWITCH STATION
- OS — SWITCH-BOX OCCUPANCY SENSOR
- OS — CEILING MOUNT OCCUPANCY SENSOR
- ODS — COMBINATION CEILING MOUNT OCCUPANCY DAYLIGHT SENSOR
- DS — CEILING MOUNT DAYLIGHT SENSOR
- VS — SWITCH-BOX VACANCY SENSOR
- VS — CEILING MOUNT VACANCY SENSOR
- PC — EXTERIOR PHOTOELECTRIC SWITCH
- SURFACE MOUNT LIGHT FIXTURE
- SURFACE MOUNT LIGHT FIXTURE - EMERGENCY
- STRIP/INDUSTRIAL FIXTURE
- LINEAR WALL BRACKET
- WALL MOUNTED FIXTURE
- RECESSED FIXTURE
- CEILING MOUNTED FIXTURE
- POLE MOUNT LUMINAIRE
- BOLLARD
- FLOOD LIGHT
- CEILING OR WALL MOUNTED EXIT, SINGLE FACE
- EMERGENCY WALL PACK (EBU)
- EMERGENCY WALL PACK REMOTE HEAD

GENERAL LEGEND

- NEW ELECTRICAL COMPONENT
- EXISTING ELECTRICAL COMPONENT
- DEMOLISHED ELECTRICAL COMPONENT
- E## — KEY NOTE
- TYPICAL CIRCUIT
- UNSWITCHED CIRCUIT

POWER LEGEND

- SINGLE RECEPTACLE
- DUPLEX RECEPTACLE
- DUPLEX RECEPTACLE 6" ABOVE COUNTER OR BACKSPLASH OR AT HEIGHT INDICATED
- DOUBLE DUPLEX RECEPTACLE
- SPECIAL PURPOSE OUTLET
- DUPLEX FLOOR OUTLET
- DOUBLE DUPLEX FLOOR OUTLET
- PUSH BUTTON
- J — JUNCTION BOX
- CIRCUIT BREAKER
- GROUND
- TRANSOCKET
- SURFACE MOUNT PANEL
- RECESSED PANEL
- METER
- NON-FUSED DISCONNECT
- FUSED DISCONNECT
- MAGNETIC STARTER
- COMBINATION STARTER
- MOTOR
- POWER ASSIST OPERATOR PUSH PLATE

GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL REQUIRED COMPONENTS FOR A COMPLETE INSTALLATION. CONTRACTOR SHALL FURNISH AND INSTALL MATERIAL,EQUIPMENT, DEVICES, FIXTURES, SERVICE REQUIREMENTS NECESSARY TO CONFORM TO THE STRUCTURE, EQUIPMENT CONNECTIONS, FOR A COMPLETE AND FUNCTIONAL INSTALLATION AND SHALL MAINTAIN APPROPRIATE CLEARANCES.
2. ALL WORK SHALL COMPLY WITH APPLICABLE NATIONAL, STATE, LOCAL CODES, FEDERAL AND STATE REGULATIONS, AND ALL REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION.
3. CONTRACTOR SHALL COORDINATE WORK WITH ALL OTHER TRADES PRIOR TO INSTALLATION.
4. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE THE FULL EXTENT OF WORK AND PROJECT CONDITIONS. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF THE OBLIGATIONS OF THE CONTRACT.
5. THE CONTRACTOR SHALL CHECK ALL DRAWINGS AND SPECIFICATIONS OF OTHER TRADES AND INCLUDE IN THEIR BID ANY ADDITIONAL WORK REQUIRED BY THIS TRADE.
6. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS AND MOUNTING HEIGHTS OF ALL LIGHT SWITCHES, POWER, AND COMMUNICATIONS OUTLETS. ALL OUTLETS SHALL BE MOUNTED VERTICALLY UNLESS OTHERWISE NOTED. COORDINATE ALL FINAL DEVICE REQUIREMENTS WITH ARCHITECT PRIOR TO INSTALLATION.
7. ALL CONDUITS SHOULD BE SUPPORTED IN COMPLIANCE WITH CODE REQUIREMENTS AND INSTALLED IN A MANNER AS TO AFFORD MINIMUM INTERFERENCE WITH OTHER TRADES. ALL CONDUITS ABOVE CEILING SHALL BE RIGIDLY SUPPORTED BY SUITABLE HANGERS FROM THE STRUCTURAL SLAB DECK OR FRAMING ABOVE INDEPENDENT OF THE CEILING, CEILING SUPPORT SYSTEM AND OTHER TRADE COMPONENTS. ALL CONDUITS SHALL BE CONCEALED UNLESS OTHERWISE NOTED ON DRAWINGS.
8. FIRE RATED SEALS SHALL BE PROVIDED FOR ALL CONDUIT PENETRATIONS THROUGH FIRE RATED FLOORS, WALLS, AND CEILINGS.
9. CONTRACTOR SHALL VERIFY ALL EQUIPMENT CONNECTION CONFIGURATIONS BEFORE PURCHASE. ALL DEVICES SHOWN ARE FOR REFERENCE ONLY. TO COMMUNICATE DESIGN INTENT, FINAL LOCATIONS SHALL BE VERIFIED PRIOR TO INSTALLATION. THIS NOTE SHALL APPLY TO, BUT NOT BE LIMITED TO, RECEPTACLES, SWITCHES, DATA PORTS, AUDIO/VIDEO DEVICES, AND TELEPHONE JACKS.
10. THE CONTRACTOR SHALL COORDINATE AND VERIFY ALL ABOVE CEILING REQUIREMENTS (PLENUM, NON-PLENUM, AIR HANDLING, ETC.) AS REQUIRED BY LOCAL AUTHORITY BEFORE THE INSTALLATION AND PURCHASE OF ELECTRICAL EQUIPMENT, MATERIALS AND DEVICES, WIRING, CABLING, AND THE ORDERING OF LIGHTING FIXTURES.
11. CONDUCTOR SIZES INDICATED ARE MINIMUM SIZES BASED ON 60°C COPPER CONDUCTOR 100 AMPS OR LESS AND 75°C COPPER CONDUCTOR GREATER THAN 100 AMPS. AMPACITIES OF CONDUCTORS DO NOT TAKE VOLTAGE DROP INTO CONSIDERATION. CONTRACTOR SHALL SIZE CONDUCTORS FOR FEEDERS AND BRANCH CIRCUITS TO PREVENT A VOLTAGE DROP EXCEEDING 3 PERCENT AT THE FARTHEST OUTLET OF POWER, HEATING, AND LIGHTING LOADS, OR COMBINATION OF SUCH LOADS, AND WHERE THE MAXIMUM TOTAL VOLTAGE DROP ON BOTH FEEDERS AND BRANCH CIRCUITS TO THE FARTHEST OUTLET DOES NOT EXCEED 5 PERCENT, TO PROVIDE REASONABLE EFFICIENCY OF OPERATION.

ELECTRICAL SHEET INDEX

Architect
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ELECTRICAL NOTES, LEGEND, AND ABBREVIATIONS

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E0.1

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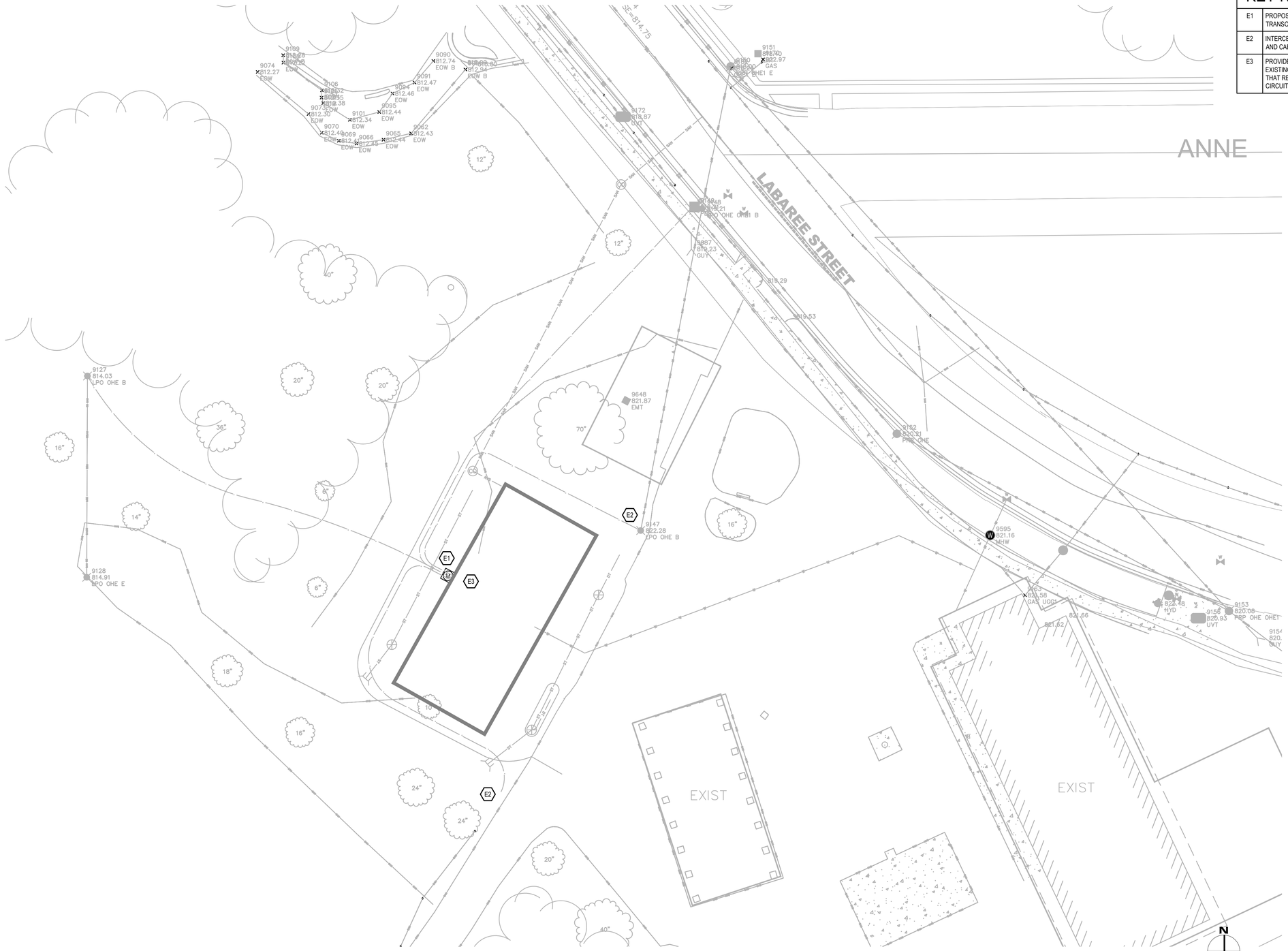
KEY NOTES

E1	PROPOSED LOCATION OF NEW 240V/120V, 100A SERVICE TRANSOCKET. COORDINATE WITH UTILITY.
E2	INTERCEPT AND REROUTE EXISTING ELECTRICAL CONDUIT AND CABLE AROUND NEW BUILDING.
E3	PROVIDE NEW 42 CIRCUIT, 240/120V PANELBOARD. EXTEND EXISTING CIRCUITS FROM EXISTING PANEL BEING REMOVED THAT REMAIN TO NEW PANEL. VERIFY IN FIELD WHICH CIRCUITS ARE TO REMAIN.



1 ELECTRICAL SITE PLAN
SCALE: 1/16" = 1'-0"

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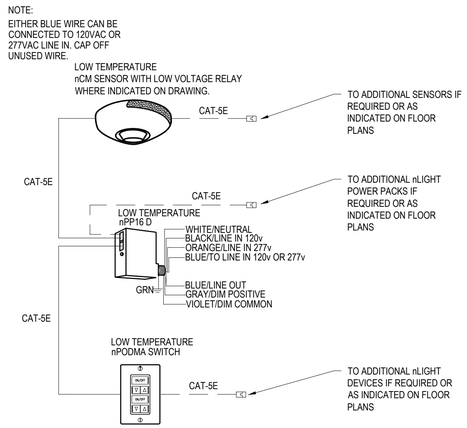
SHEET NOTES

1. EMERGENCY BATTERY UNITS SHALL BE CIRCUITED TO THE UNSWITCHED PORTION OF THE NEAREST LIGHTING BRANCH CIRCUIT SERVING THE IMMEDIATE AREA.

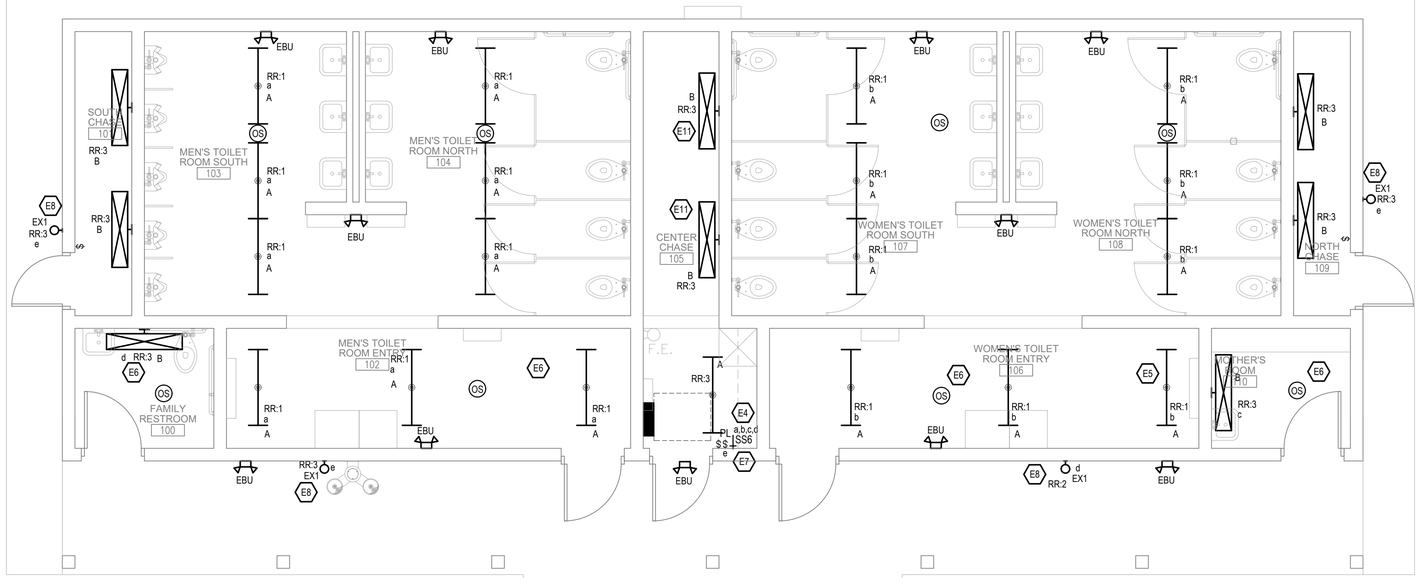
KEY NOTES

E4	MANUAL SWITCH IS TO SERVE LOCAL ELECTRICAL/MECHANICAL ROOM. SS6 IS TO OVERRIDE INTERIOR TOILET LIGHTS AND THE OTHER MANUAL PILOT SWITCH IS TO OVERRIDE EXTERIOR LIGHTS. SWITCHES SHALL BE LABELED INTERIOR LIGHTING AND EXTERIOR LIGHTING. SS6 SHALL BE 4 ZONE DIMMING SWITCH.
E5	LIGHT FIXTURE TYPE A TO BE MOUNTED TO BOTTOM OF CEILING UNLESS INDICATED OTHERWISE.
E6	PROVIDE AUXILIARY CONTACT FOR FAN CONTROL. SWITCH DOES NOT CONTROL FAN.
E7	ZONE LOW VOLTAGE SWITCH, ONE CONTROL FOR EACH TOILET ROOM.
E8	BOTTOM OF FIXTURE SHALL BE 80" AFF.



1 TYPICAL nLIGHT 0-10V DIMMING WIRING DIAGRAM

N.T.S.



1 ELECTRICAL LIGHTING FLOOR PLAN

SCALE: 1/4" = 1'-0"

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E2.0

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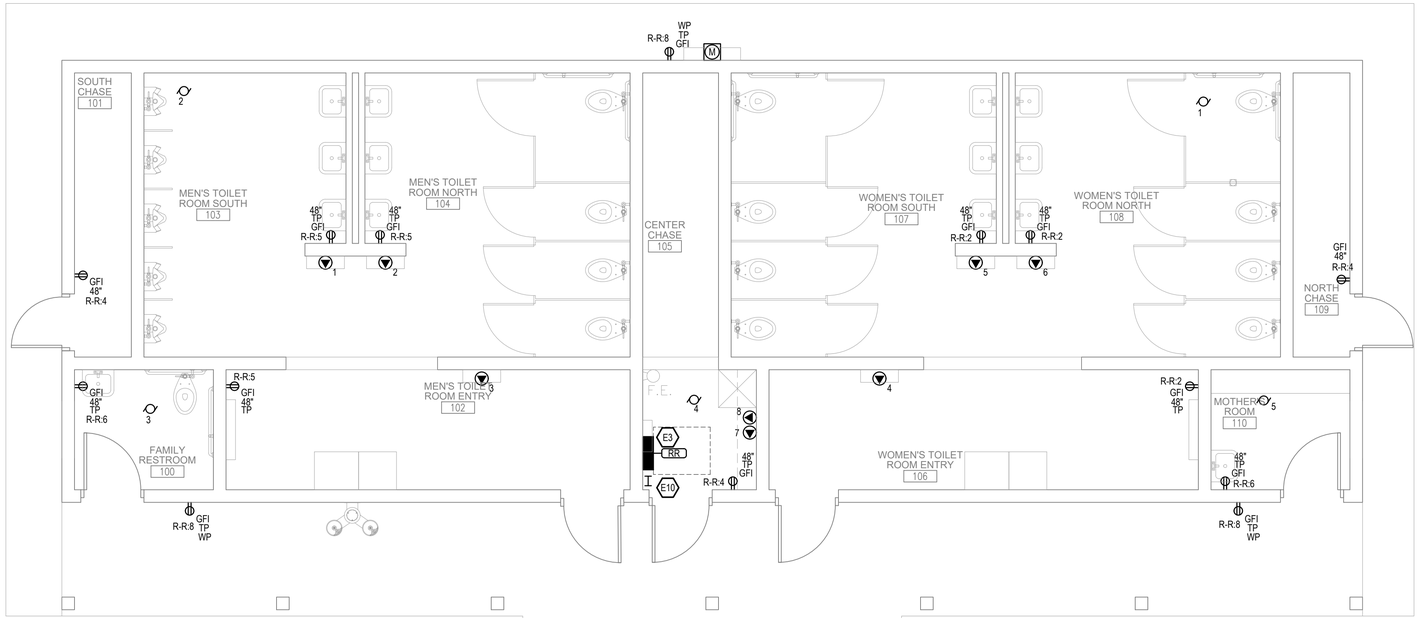
KEY NOTES

E3	PROVIDE NEW 42 CIRCUIT, 240/120V PANELBOARD. EXTEND EXISTING CIRCUITS FROM EXISTING PANEL BEING REMOVED THAT REMAIN TO NEW PANEL. VERIFY IN FIELD WHICH CIRCUITS ARE TO REMAIN.
E10	PROPOSED LOCATION OF GROUND BAR LOCATED ABOVE PANEL.



N

1 ELECTRICAL POWER & SYSTEMS FLOOR PLAN
SCALE: 1/4" = 1'-0"

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ELECTRICAL POWER & SYSTEMS FLOOR PLAN

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PANEL NAME: R-R

LOCATION:	ELECTRICAL	VOLTS:	120/240	AIC RATING:	10,000
SUPPLY FROM:	UTILITY	PHASES:	1	MAINS TYPE:	MCB
MOUNTING:	SURFACE	WIRES:	3	BUS RATING:	200A
ENCLOSURE:	NEMA 250 TYPE 4			MCB RATING:	150A

POLE NO.	POLES	AMP	DESCRIPTION	NOTES	A		B		DESRIPTION	NOTES	AMP	POLES	POLE NO.
1	1	20	LIGHTS		920	540			RECPT - RR		20	1	2
3	1	20	EXHAUST FAN 4 AND LIGHTS				531	540	RECPT - ELECTRICAL ROOM/PLUMBING CHASE		20	1	4
5	1	20	RECPT - RR		410	360			RECPT - FAMILY RR/MOTHERS ROOM		20	1	6
7	1	20	EXHAUST FAN 1,5				700	540	RECPT - OUTSIDE		20	1	8
9	1	20	EXHAUST FAN 2,3		700	2400			HAND DRYER	1	25	1	10
11	1	20	SPARE					2400	HAND DRYER	1	25	1	12
13	1	20	RECIRCULATION PUMP		55	2400			HAND DRYER	1	25	1	14
15	2	50	WATER HEATER				4800	2400	HAND DRYER	1	25	1	16
17	-	-	-		4800	2400			HAND DRYER	1	25	1	18
19	1	20	SPARE					2400	HAND DRYER	1	25	1	20
21	1	20	SPARE						SPARE		20	1	22
23	1	20	SPARE						SPARE		20	1	24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
			PHASE TOTAL:		14985		14311						
			TOTAL LOAD:		29296								

NOTES:
1. GFI BREAKER
2. SHUNT TRIP BREAKER

MOTOR WIRING SCHEDULE

NO.	LOAD DESCRIPTION	LOC.	HP	FLA	VOLT	PH.	FEED FROM		BREAKER		SEE NOTE
							PANEL	CIRCUIT	SIZE	POLE	
1	EF-1	WOMEN	1/4	3.8	120	1	RR	7	20	1	1,3
2	EF-2	MEN	1/4	3.8	120	1	RR	9	20	1	1,3
3	EF-3	FAMILY		0.1	120	1	RR	9	20	1	1.3
4	EF-4	JANITOR		0.1	120	1	RR	3	20	1	2,3
5	EF-5	MOTHER		0.1	120	1	RR	7	20	1	1,3

REMARKS:
A. ELECTRICAL CONTRACTOR TO PROVIDE PROPERLY RATED FUSED DISCONNECT FUSED PER EQUIPMENT NAMEPLATE WITHIN SIGHT OF EQUIPMENT, UNLESS OTHERWISE NOTED IN THE MECHANICAL DRAWINGS.
B. REFER TO MECHANICAL SHEETS FOR TYPE OF CONTROLLERS PROVIDED WITH THE HVAC EQUIPMENTNT. CONTROLLER TO BE WIRED BY EC UNLESS INDICATED OTHERWISE.

NOTES:
1. EXHAUST FANS ARE CONTROLLED VIA CONTACT IN COMBINATION OCCUPANCY/DAYLIGHT SENSOR.
2. EXHAUST FANS ARE CONTROLLED ON/OFF WITH LIGHT SWITCH
3. PROVIDE NON FUSED DISCONNECT SWITCH

SPECIAL PURPOSE OUTLET SCHEDULE

NO.	LOAD DESCRIPTION	LOCATION	KW	FLA	VOLT	PH	FEED FROM		BREAKER		OUTLET	SEE NOTE
							PANEL	CKT	SIZE	POLE		
1	HAND DRYER	MENS	2.4	20	120	1	RR	10	25	1	DIRECT	
2	HAND DRYER	MENS	2.4	20	120	1	RR	12	25	1	DIRECT	
3	HAND DRYER	MENS	2.4	20	120	1	RR	14	25	1	DIRECT	
4	HAND DRYER	WOMENS	2.4	20	120	1	RR	16	25	1	DIRECT	
5	HAND DRYER	WOMENS	2.4	20	120	1	RR	18	25	1	DIRECT	
6	HAND DRYER	WOMENS	2.4	20	120	1	RR	20	25	1	DIRECT	
7	RECIRCULATION PUMP	ELEC/MECH	0.055	-	120	1	RR	13	20	1	DIRECT	2
8	WATER HEATER	ELEC/MECH	9.5		240	1	RR	15,17	50	2	DIRECT	1

REMARKS:
A. REFER TO EQUIPMENT DATA SHEET FOR ADDITIONAL INFORMATION.
B. COORDINATE WITH EQUIPMENT SUPPLIER FOR INSTALLATION REQUIREMENTS.
C. FOR DIRECT CONNECTED EQUIPMENT, TERMINATE EQUIPMENT WIRING IN A JUNCTION BOX WITH PROPERLY RATED WIRE NUTS.

NOTES:
1. PROVIDE A FUSED DISCONNECT FUSED PER EQUIPMENT NAME PLATE.
2. PROVIDE A PILOT LIGHT DISCONNECT TO ILLUMINATE WHEN PUMP IS ENERGIZED.

LIGHTING FIXTURE SCHEDULE

FIXT.	DESCRIPTION	LAMPING			VOLT	MANUFACTURER	CATALOG NUMBER	MOUNTING	SEE NOTE
		NO.	TYPE	INPUT					
A	SURFACE MOUNT STRIP LIGHT		2923 LUMEN, 4000K LED	44.5	120	COOPER	FVS4-P-4-LD4-1-HI-40-120-OPL-EDD1	SURFACE	
B	WALL MOUNT STRIP LIGHT		2923 LUMEN, 4000K LED	44.5	120	COOPER	FVS4-WP-4-LD4-1-HI-40-120-OPL-EDD1	SURFACE	
EX1	EXTERIOR WALL MOUNT		3500 LUMEN, 4000K LED	25	UNV	HUBBELL	RWL1-48L-25-4K7-3-PC	SURFACE	
EBU	EMERGENCY BATTERY UNIT		LED W/ UNIT	3	UNV	LITHONIA	AFO-W-MVOLT-N-SD-CW	SURFACE	

REMARKS:
A. CONTRACTOR SHALL CONFIRM CEILING TYPE REQUIREMENTS PRIOR TO THE RELEASE OF THE ORDER.
B. CATALOG NUMBERS ARE TO PROVIDE GUIDANCE ONLY AND MAY NOT BE COMPLETE.
C. FIXTURES SPECIFIED TO MEET DESIGN INTENT. EQUALS MAY BE SUBSTITUTED SUBJECT TO DESIGN TEAM'S APPROVAL.
D. PROVIDE ALL PARTS AND PIECES NECESSARY FOR A COMPLETE AND FUNCTIONAL INSTALLATION.
E. ARCHITECT TO DETERMINE ALL FINISHES.
F. VERIFY DIMMING CONTROLS ARE COMPATIBLE WITH DIMMING DRIVER SELECTED FOR FIXTURE.

FEEDER SCHEDULE

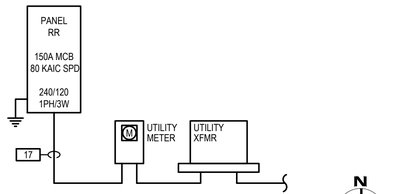
ID #	AMPS	SINGLE PHASE, 2 WIRE		1 OR 3 PHASE, 3 WIRE		THREE PHASE, 4 WIRE		ALL
		CND SIZE	PHASE CONDUCTORS	CND SIZE	PHASE CONDUCTORS	CND SIZE	PHASE CONDUCTORS	EQUIP. GRD. CONDUCTOR
1	10	3/4"	(2) #12	3/4"	(3) #12	3/4"	(4) #12	#12
2	15	3/4"	(2) #12	3/4"	(3) #12	3/4"	(4) #12	#12
3	20	3/4"	(2) #12	3/4"	(3) #12	3/4"	(4) #12	#12
4	25	3/4"	(2) #10	3/4"	(3) #10	3/4"	(4) #10	#10
5	30	3/4"	(2) #10	3/4"	(3) #10	3/4"	(4) #10	#10
6	35	3/4"	(2) #8	3/4"	(3) #8	1"	(4) #8	#10
7	40	3/4"	(2) #8	3/4"	(3) #8	1"	(4) #8	#10
8	45	3/4"	(2) #6	1"	(3) #6	1"	(4) #6	#10
9	50	3/4"	(2) #6	1"	(3) #6	1"	(4) #6	#10
10	60	1"	(2) #4	1"	(3) #4	1-1/4"	(4) #4	#10
11	70	1"	(2) #4	1-1/4"	(3) #4	1-1/4"	(4) #4	#8
12	80	1"	(2) #3	1-1/4"	(3) #3	1-1/4"	(4) #3	#8
13	90	1-1/4"	(2) #2	1-1/4"	(3) #2	1-1/2"	(4) #2	#8
14	100	1-1/4"	(2) #1	1-1/2"	(3) #1	1-1/2"	(4) #1	#8
15	110	1"	(2) #2	1-1/4"	(3) #2	1-1/2"	(4) #2	#6
16	125	1-1/4"	(2) #1	1-1/2"	(3) #1	1-1/2"	(4) #1	#6
17	150	1-1/4"	(2) #1/0	1-1/2"	(3) #1/0	2"	(4) #1/0	#6
18	175	N / A	N / A	2"	(3) #2/0	2"	(4) #2/0	#6
19	200	N / A	N / A	2"	(3) #3/0	2"	(4) #3/0	#6
20	225	N / A	N / A	2"	(3) #4/0	2-1/2"	(4) #4/0	#4
21	250	N / A	N / A	2-1/2"	(3) 250 kcmil	3"	(4) 250 kcmil	#4
22	300	N / A	N / A	3"	(3) 350 kcmil	3"	(4) 350 kcmil	#4
23	350	N / A	N / A	3"	(3) 500 kcmil	3-1/2"	(4) 500 kcmil	#3
24	400	N / A	N / A	(2) 2"	2 SETS OF (3) #3/0	(2) 2"	2 SETS OF (4) #3/0	#3
25	450	N / A	N / A	(2) 2"	2 SETS OF (3) #4/0	(2) 2-1/2"	2 SETS OF (4) #4/0	#2
26	500	N / A	N / A	(2) 2-1/2"	2 SETS OF (3) 250 kcmil	(2) 3"	2 SETS OF (4) 250 kcmil	#2
27	600	N / A	N / A	(2) 3"	2 SETS OF (3) 350 kcmil	(2) 3"	2 SETS OF (4) 350 kcmil	#1
28	700	N / A	N / A	(2) 3"	2 SETS OF (3) 500 kcmil	(2) 3-1/2"	2 SETS OF (4) 500 kcmil	#1/0
29	800	N / A	N / A	(3) 2-1/2"	3 SETS OF (3) 300 kcmil	(3) 3"	3 SETS OF (4) 300 kcmil	#1/0
30	900	N / A	N / A	(3) 3"	3 SETS OF (3) 350 kcmil	(3) 3"	3 SETS OF (4) 350 kcmil	#2/0
31	1000	N / A	N / A	(4) 2-1/2"	4 SETS OF (3) 250 kcmil	(4) 3"	4 SETS OF (4) 250 kcmil	#2/0
32	1200	N / A	N / A	(4) 3"	4 SETS OF (3) 350 kcmil	(4) 3"	4 SETS OF (4) 350 kcmil	#3/0
33	1600	N / A	N / A	(5) 3"	5 SETS OF (3) 400 kcmil	(5) 3"	5 SETS OF (4) 400 kcmil	#4/0
34	1800	N / A	N / A	(6) 3"	6 SETS OF (3) 350 kcmil	(6) 3"	6 SETS OF (4) 350 kcmil	250 kcmil
35	2000	N / A	N / A	(6) 3"	6 SETS OF (3) 500 kcmil	(6) 3-1/2"	6 SETS OF (4) 500 kcmil	250 kcmil
36	2500	N / A	N / A	(8) 3"	8 SETS OF (3) 400 kcmil	(8) 3"	8 SETS OF (4) 400 kcmil	350 kcmil
37	3000	N / A	N / A	(8) 3"	8 SETS OF (3) 500 kcmil	(8) 3-1/2"	8 SETS OF (4) 500 kcmil	400 kcmil

SCHEDULE BASED ON NEC TABLE 310.15(B)(16), 60 DEGREE CELSIUS CONDUCTOR 100 AMPS OR LESS AND 75 DEGREE CELSIUS CONDUCTOR GREATER THAN 100 AMPS. SIZES REFERENCED ARE MINIMUM. CONTRACTOR SHALL BE RESPONSIBLE FOR FINAL CONDUCTOR SIZES TO ACCOMMODATE VOLTAGE DROP.
PLAN NOTATION:

(X) - SINGLE-PHASE, TWO-WIRE FEEDER, NUMBER IS THE FEEDER ID #

[X] - SINGLE OR THREE-PHASE, THREE-WIRE FEEDER, NUMBER IS THE FEEDER ID #

(X) - THREE PHASE, FOUR-WIRE FEEDER, NUMBER IS THE FEEDER ID#



1 PARTIAL ONE-LINE DIAGRAM
SCALE: 1/8" = 1'-0"

NOTES:
1. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PANEL EQUIPMENT RATED FOR OR EXCEEDING THE SHORT CIRCUIT RATING AT THE POINT OF INSTALLATION AND PROVIDING ARC FLASH LABELS PER NEC.

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Project Info. — 22005
Riverside Park Restrooms
New Construction
600 Labaree St
Watertown, WI

Sheet Title
ELECTRICAL RISER & SCHEDULES

Drawn by	Checked by

Revisions

No.	Date	Description
	06.30.2023	Bid & Permit Set

2023-06-30 Bid & Permit Set

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Sheet No.
E4.0

PLUMBING FIXTURE SCHEDULE

MARK	MANUFACTURER	MODEL	DESCRIPTION	WSFU			DFU
				HW	CW	TOTAL	VALUE
DF-1	ELKAY	LK4409BFGRY	OUTDOOR, WALL MOUNTED BI-LEVEL DRINKING FOUNTAIN WITH BOTTLE FILLING STATION, HEAVY DUTY, STAINLESS STEEL, VANDAL RESISTANT, PUSH BUTTON ACTIVATED, GRAY FINISH.	-	0.25	0.25	0.5
FD-1	ZURN	Z415S	SQUARE CAST IRON FLOOR DRAIN, COMBINATION INVERTIBLE MEMBRANE CLAMP AND ADJUSTABLE COLLAR WITH SEEPAGE SLOTS. POLISHED NICKLE BRONZE, HEEL-PROOF TOP, LIGHT DUTY STRAINER.	-	-	-	4.0
HB-1	WOODFORD	B65	HOSE BIBB IN CONCEALED, LOCKABLE BOX, NON-FREEZE, LOOSE KEY, AUTOMATIC DRAINING WITH ANTI-SIPHON VACUUM BREAKER, CHROME FINISH	-	4.0	4.0	-
L-1	KOHLER	K-2031	WALL HUNG, WHITE, VITREOUS CHINA, ADA LAVATORY WITH OVERFLOW AND BACKSPLASH. OVERALL DIMENSIONS: 20-3/4"X18-1/4"X12-7/8". FAUCET: CHICAGO FAUCETS 116.606.AB.1 BATTERY POWERED, SENSOR ACTIVATED, SINGLE HOLE WITH 0.5 GPM NON-AERATING LAMINAR FLOW, VANDAL PROOF. PROVIDE WITH KOHLER K-7129-A GRID DRAIN, P-TRAP, AND LOOSE KEY STOPS. PROVIDE "HANDY-SHIELD MAXX" INSULATION ON P-TRAP, WATER VALVES AND EXPOSED SUPPLY PIPING.	0.5	0.5	1.0	1.0
MB-1	MUSTEE	63M	FLOOR MOUNTED, MOLDED STONE MOP BASIN WITH OVERALL DIMENSIONS: 24"X24"X10". FAUCET: MUSTEE 63.300A HEAVY DUTY, CHROME PLATED BRASS WITH TOP REINFORCING BAR AND PAIL HOOK. PROVIDE WITH HOSE CONNECTION VACUUM BREAKER EQUAL TO WATTS 8FR. PROVIDE WITH MUSTEE 65.700 HOSE AND HOSE HOLDER AND MUSTEE 65.600 MOP HANGER.	2.0	2.0	3.0	3.0
UR-1	KOHLER	K-4991-ET	VITREOUS CHINA WALL-MOUNT ADA WASHOUT URINAL WITH 3/4" TOP SPUD. OVERALL DIMENSIONS: 26 7/8" X 18" X 14 1/8". FLUSHOMETER: SLOAN G2 8186 BATTERY POWERED, SENSOR ACTIVATED, 0.5 GPF. FIXTURE SUPPORT: JAY R. SMITH 0637.	-	2.0	2.0	2.0
WC-1	KOHLER	K-96057	VITREOUS CHINA, FLOOR MOUNT, SIPHON JET, ADA WATER CLOSET WITH 1-1/2" TOP SPUD. OVERALL DIMENSIONS: 21-7/8"X14-5/8"X16-5/8". FLUSHOMETER: SLOAN G2 8111 BATTERY POWERED, SENSOR ACTIVATED, 1.28 GPF.	-	6.5	6.5	6.0

NOTES: CONTRACTOR IS RESPONSIBLE FOR COORDINATING NECESSARY ELECTRICAL PROVISION WITH DIVISION 26 CONTRACTOR. DIVISION 22 CONTRACTOR IS RESPONSIBLE FOR ALL LOW VOLTAGE (24V) WIRING FOR ALL PLUMBING FIXTURES AND EQUIPMENT. PROVIDE ALL NECESSARY TRANSFORMERS TO ACCOMMODATE POWER SUPPLIES INDICATED ON ELECTRICAL DRAWINGS. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR ANY POWER SUPPLY PROVISIONS BEYOND WHAT IS INDICATED ON THE ELECTRICAL DRAWINGS.

PUMPS

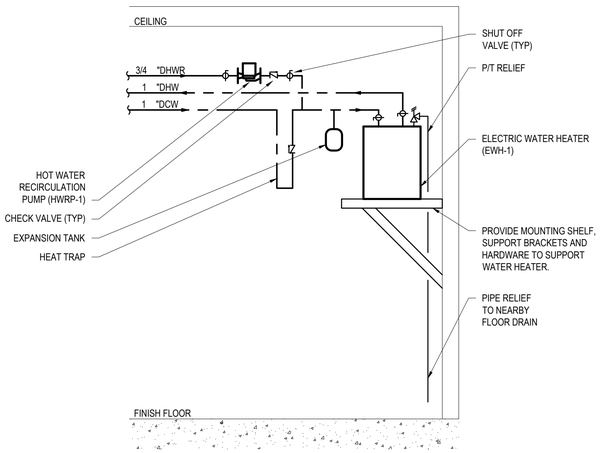
MARK	MANUFACT	MODEL	TYPE	SERVICE	GPM MIN.	HEAD FT WC	MOTOR (WATTS)	RPM	VOLTS	PHASE	REMARKS
HWRP -1	BELL & GOSSETT	NBF-12	INLINE	BRONZE	2	10	55	2,800	120	1	1,2

1. PROVIDE WITH STARTER & DISCONNECT.
2. PROVIDE WITH AQUASTAT & TIMER.

ELECTRIC WATER HEATER

MARK	MANUFACTURER	MODEL	GALLON CAPACITY	DATA			HEIGHT	DIAMETER	REMARKS
				KW	VOLT	PHASE			
EWH-1	A.O. SMITH	DSE-20A-9	20	9	240	1	31.75"	22"	1,2

1 INCLUDE TEMPERATURE CONTROL, PRESSURE RELIEF VALVE, DRAIN VALVE
2 SINGLE ELEMENT WATER HEATER
3 PROVIDE WITH EXPANSION TANK EQUAL TO B&G PTA-5



1 ELECTRIC WATER HEATER DETAIL
N.T.S.

ABBREVIATIONS

AD	AREA DRAIN
AFF	ABOVE FINISHED FLOOR
AP	ACCESS PANEL
BOP	BOTTOM OF PIPE
CA	COMBUSTION AIR
CO	CLEANOUT
DN	DOWN
ET-*	EXPANSION TANK
EWC-*	ELECTRIC WATER COOLER
FCO	FLOOR CLEANOUT
FD-*	FLOOR DRAIN
GI-*	GREASE INTERCEPTOR
HB-*	HOSE BIBB
HWRP-*	HOT WATER RECIRCULATION PUMP
IWH-*	INSTANTANEOUS WATER HEATER
L-*	LAVATORY
MB-*	MOP BASIN
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OD-*	OVERFLOW DRAIN
RD-*	ROOF DRAIN
S-*	SINK
SH-*	SHOWER
SP-*	SUMP PUMP
SS-*	SERVICE SINK
ST-*	STORAGE TANK
STP-*	SOLAR THERMAL PANEL
UR-*	URINAL
VFD	VARIABLE FREQUENCY DRIVE
WC-*	WATER CLOSET
WCO	WALL CLEANOUT
WH-*	WATER HEATER
WWHP-*	WATER-TO-WATER HEAT PUMP
X-*	EXISTING
YCO	YARD CLEANOUT

PLUMBING PIPING LEGEND

- NEW PLUMING EQUIPMENT
- EXISTING PLUMBING COMPONENT
- DEMOLISHED PLUMBING COMPONENT
- PLUMBING EQUIPMENT SERVICE AREA
- P## — KEY NOTE
- DCW — NEW DOMESTIC COLD WATER
- X-DCW — EXISTING DOMESTIC COLD WATER
- DHW — NEW DOMESTIC HOT WATER
- X-DHW — EXISTING DOMESTIC HOT WATER
- DHWR — NEW DOMESTIC HOT WATER RETURN
- X-DHWR — EXISTING DOMESTIC HOT WATER RETURN
- DTW — NEW DOMESTIC TEMPERED WATER
- X-DTW — EXISTING DOMESTIC TEMPERED WATER
- FPCH — NEW FIRE PROTECTION - CHEMICAL PIPE
- FPD — NEW FIRE PROTECTION - DRY PIPE
- FPW — NEW FIRE PROTECTION - WET PIPE
- X-FP — EXISTING FIRE PROTECTION
- IRR — NEW IRRIGATION
- X-IRR — EXISTING IRRIGATION
- SS — NEW SANITARY SEWER
- X-SS — EXISTING SANITARY SEWER
- V — NEW SANITARY VENT
- X-V — EXISTING SANITARY VENT
- STOF — NEW STORM OVERFLOW
- X-STOF — EXISTING STORM OVERFLOW
- SD — NEW STORM SEWER
- X-SD — EXISTING STORM SEWER
- DEMOLISHED PIPING (ALL SYSTEMS)
- EQUIPMENT / WH X-X / FLOOR TAG — PLUMBING EQUIPMENT TAG ELECTRICALLY POWERED
- EQUIPMENT / WC X-X / FLOOR TAG — PLUMBING EQUIPMENT TAG NOT ELECTRICALLY POWERED

- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- CIRCUIT SETTER
- 2-WAY ELECTRONIC CONTROL VALVE
- 3-WAY ELECTRONIC CONTROL VALVE
- GATE VALVE
- HOSEBIBB/DRAIN VALVE
- OS&Y VALVE
- PLUG VALVE
- PRESSURE & TEMPERATURE RELIEF VALVE
- PRESSURE REGULATING VALVE
- TRIPLE DUTY VALVE
- AIR VENT
- FLEX PIPE
- FLOOR DRAIN / ROOF DRAIN
- P-T PLUG
- PIPE BREAK
- PIPE CAPPED END
- PIPE CLEANOUT
- PIPE ELBOW/TEE DOWN
- PIPE ELBOW/TEE UP
- CONNECT TO EXISTING
- PUMP
- REDUCER
- STRAINER
- UNION
- FLOW GAUGE
- FS — FLOW SENSOR
- PRESSURE GAUGE
- PS — PRESSURE SENSOR
- TEMPERATURE GAUGE
- TS — TEMPERATURE SENSOR

GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL REQUIRED OFFSETS FOR A COMPLETE INSTALLATION. CONTRACTOR SHALL INSTALL MATERIAL AND EQUIPMENT TO CONFORM TO THE STRUCTURE, EQUIPMENT CONNECTIONS AND SHALL MAINTAIN APPROPRIATE CLEARANCES.
2. ALL WORK SHALL COMPLY WITH APPLICABLE NATIONAL, STATE, LOCAL CODES, FEDERAL AND STATE REGULATIONS, AND ALL REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION.
3. CONTRACTOR SHALL COORDINATE WORK WITH ALL OTHER TRADES PRIOR TO INSTALLATION.
4. THE CONTRACTOR SHALL VISIT THE SITE TO DETERMINE THE FULL EXTENT OF WORK AND PROJECT CONDITIONS. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF THE OBLIGATIONS OF THE CONTRACT.

PLUMBING SHEET INDEX

WATER CALCULATION WORKSHEET

INFORMATION NEEDED FOR WATER SERVICE SIZING

1	Demand of building in water supply fixture units:	124.75	WSFU
1a	Demand of building in WSFU converted to Gallons per Minute.	75	GPM
2	Elevation difference from main or external pressure tank to building control valve:	8	FEET
3	Size of water meter (if applicable):	2	
4	Developed length from main or external pressure tank to building control valve	175	FEET
5	Low pressure at main in street or external pressure tank:	75	PSI

CALCULATE WATER SERVICE PRESSURE LOSS

6	Low pressure at main in street or external pressure tank. (value of # 5 above)	75	PSI
7	Determine pressure loss due to friction in [4] inch diameter water service. Water service piping is [COPPER] Pressure loss per 100 ft = [0.3] x [1.75]	0.525	
	Subtotal	74.5	PSI
8	Determine pressure loss or gain due to elevation (multiply the value of # 2 above by 0.434):	3.5	PSI
9	Available pressure after the bldg. control valve:	71.0	PSI

CALCULATE THE PRESSURE AVAILABLE FOR UNIFORM LOSS (VALUE OF "A")

A = [B - (C + D + E+F+G)] / H x 100

B	Available pressure after the bldg. control valve. (from # 9 above):	71.0	PSI
C	Pressure loss of water meter (when meter is required)	3	PSI
D	Pressure required at controlling fixture (Controlling fixture is: [WATER CLOSET])	35	PSI
E	Difference in elevation between building control valve and the controlling fixture in feet [1] x 0.434	0.4	
F	Pressure loss due to water treatment devices and backflow preventors which serve the controlling fixture.	0	PSI
G	Pressure loss through tankless water heaters, combination boiler / hot water heaters, heat exchangers which serve the controlling fixture:	0	PSI
H	Developed length from building control valve to controlling fixture in feet: [90] x 1.5	135	FT
A	**Pressure available for uniform loss (psi/100' of pipe).**	**24.1**	**PSI / 100'**

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Project Info. — 22005

Riverside Park Restrooms

New Construction

600 Labaree St
Watertown, WI

Sheet Title

PLUMBING NOTES, LEGEND, AND ABBREVIATIONS

Drawn by	Checked by
KJW	CMH

Revisions

No.	Date	Description
	06.30.2023	Bid & Permit Set

WISCONSIN COLLEEN M. HOFFMANN 40740 NEW BERLIN WIS. PROFESSIONAL ENGINEER
Colleen M Hoffmann
EXP 7/31/2024

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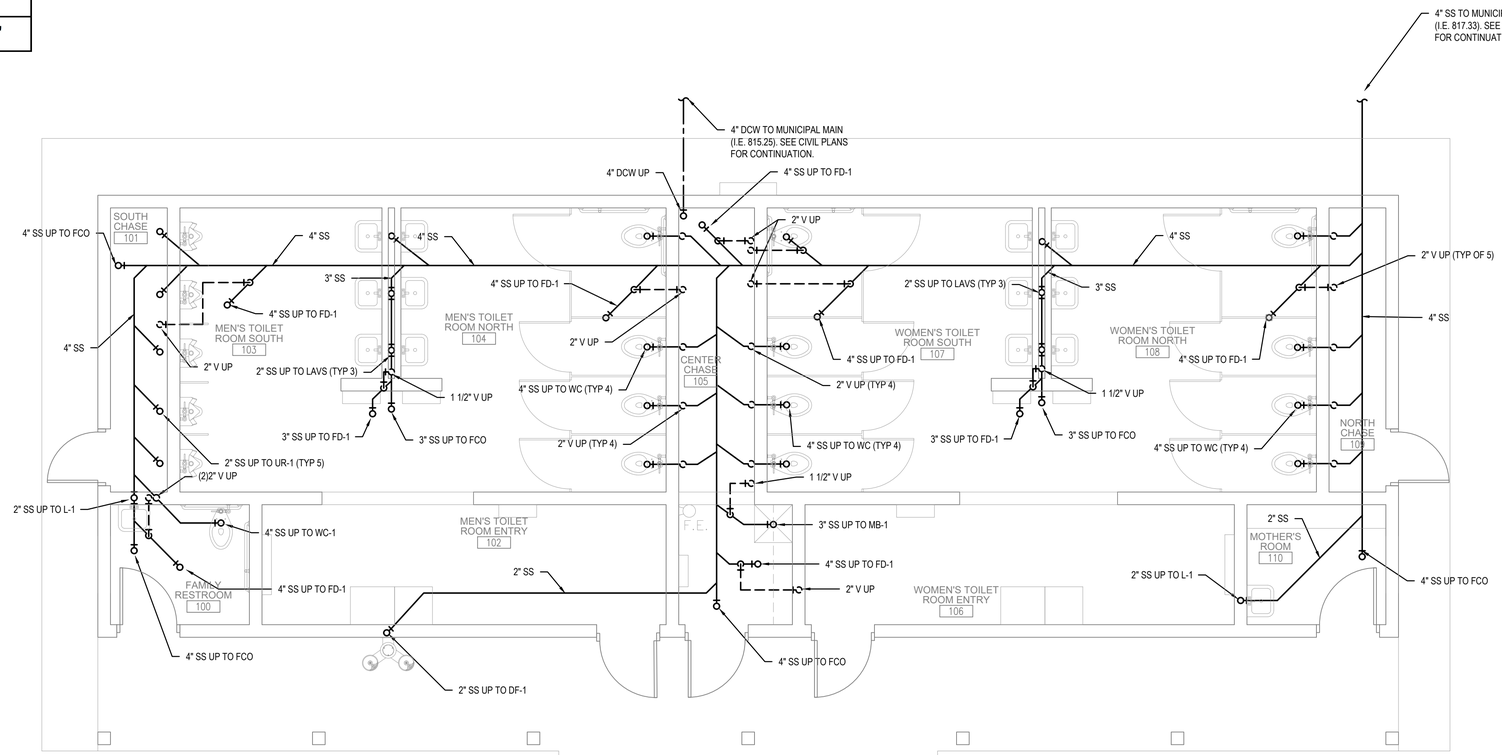
Sheet No.

P0.1

SANITARY PIPING SLOPE	
PIPE SIZE	**SLOPE**
< 2"	1/4" / 12"
> 2"	1/8" / 12"



1 PLUMBING UNDERGROUND PLAN
SCALE: 1/4" = 1'-0"

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PLUMBING UNDERGROUND PLAN

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P1.0

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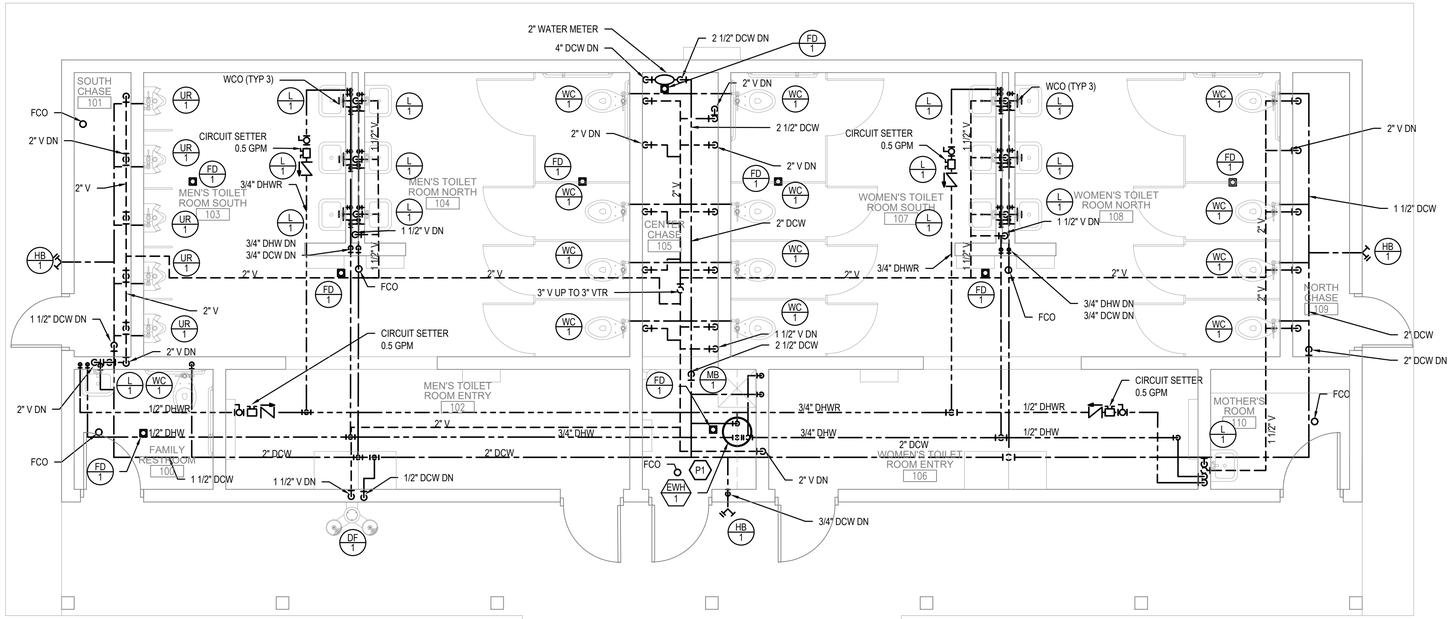
KEY NOTES

1	PIPE 1" DCW, 1" DHW, 3/4" DHWR TO EWH-1. REFER TO DETAIL 1 ON SHEET P0.1

FIXTURE CONNECTIONS				
MARK	**DCW**	**DHW**	**SS**	**V**
DF-1	1/2"	-	1 1/2"	1 1/2"
HB-1	3/4"	-	-	-
L-1	1/2"	1/2"	2"	1 1/2"
MB-1	1/2"	1/2"	3"	1 1/2"
UR-1	3/4"	-	2"	1 1/2"
WC-1	1 1/2"	-	4"	2"



1 PLUMBING FLOOR PLAN
SCALE: 1/4" = 1'-0"

N

Architect
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p: 833-380-6180

Project Info. — 22005

Riverside Park Restrooms

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Sheet Title

PLUMBING FLOOR PLAN

Drawn by	Checked by
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No.	Date	Description
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2023-06-30 Bid & Permit Set

Sheet No.

P2.0

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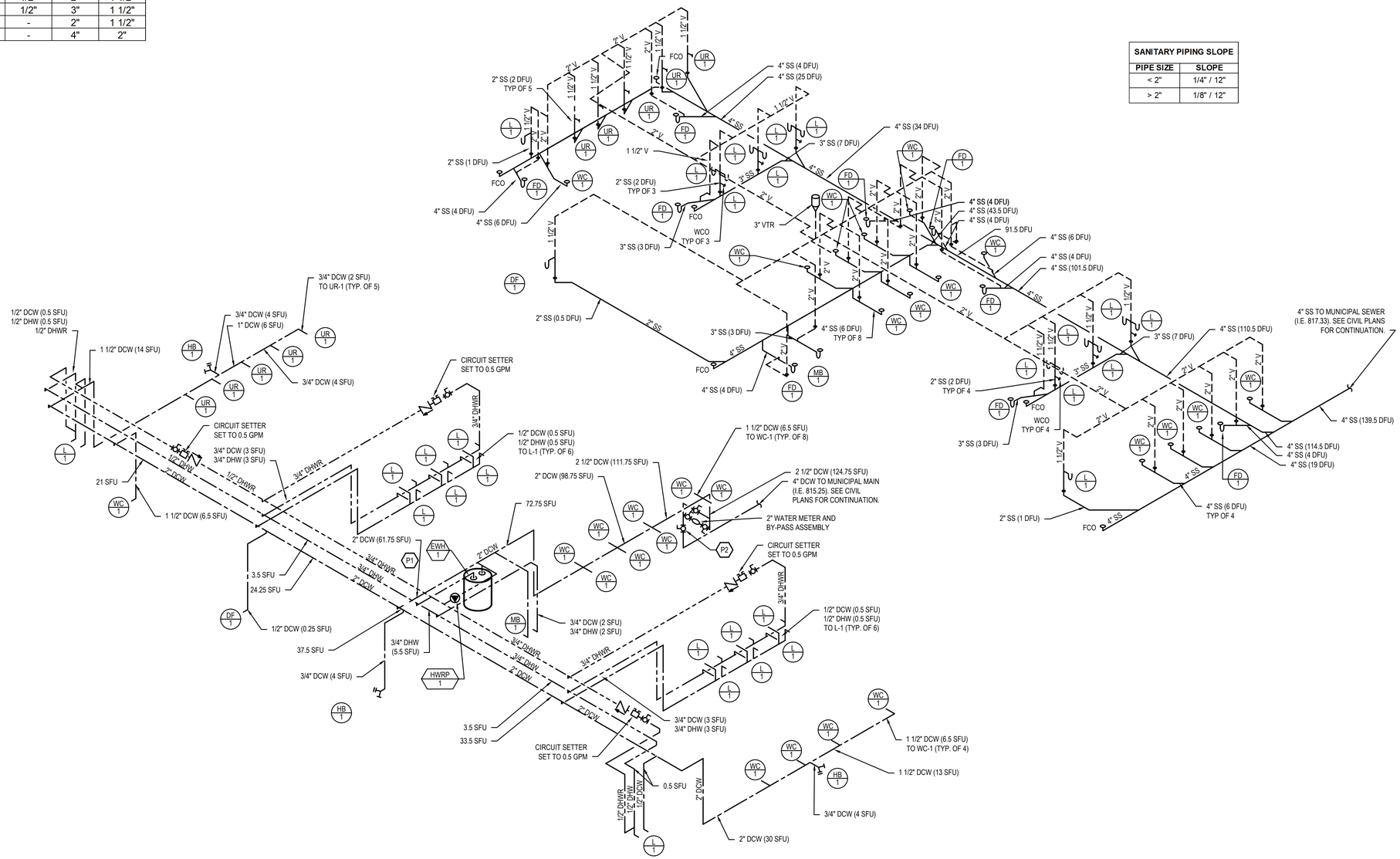
FIXTURE CONNECTIONS				
MARK	DCW	DHW	SS	V
DF-1	1/2"	-	1 1/2"	1 1/2"
HB-1	3/4"	-	-	-
L-1	1/2"	1/2"	2"	1 1/2"
MB-1	1/2"	1/2"	3"	1 1/2"
UR-1	3/4"	-	2"	1 1/2"
WC-1	1 1/2"	-	4"	2"

KEY NOTES	
1	PIPE 1" DCW (9 SFU), 1" DHW (9 SFU), 3/4" DHWR TO EWH-1. REFER TO DETAIL 1 ON SHEET P0.1
2	PROVIDE BLOWOUT VALVE AT BUILDING WATER METER FOR ADEQUATE WINTERIZATION OF TO FACILITY.

SANITARY PIPING SLOPE	
PIPE SIZE	SLOPE
< 2"	1/4" / 12"
> 2"	1/8" / 12"



1 PLUMBING ISOMETRICS
N.T.S.

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Sheet Title

PLUMBING ISOMETRICS

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2023-06-30 Bid & Permit Set

Sheet No.

P3.0

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DESIGN CRITERIA

1. BUILDING CODE - INTERNATIONAL BUILDING CODE (IBC) 2015 / ASCE7-10
2. DEAD LOADS
   - ROOF 15 PSF
3. ROOF LIVE LOADS 20 PSF
4. FLOOR LIVE LOADS
   - PUBLIC AREAS 100 PSF
   - STORAGE 125 PSF
5. SNOW LOADS
   - GROUND SNOW, Pg 30 PSF
   - EXPOSURE FACTOR, Ce 1.0
   - TEMPERATURE FACTOR, Ct 1.2
   - SLOPED ROOF FACTOR, Cs 1.0
   - IMPORTANCE FACTOR, Is 1.0
   - FLAT ROOF SNOW, Pf 25.2 PSF
   - SLOPED ROOF SNOW, Ps 25.2 PSF
   - SLIDING & DRIFTING SNOW, IN ADDITION TO FLAT ROOF SNOW, SEE PLANS
   - UNBALANCED SNOW PER ASCE 7
6. WIND LOADS
   - ULTIMATE WIND SPEED, V 115 MPH
   - RISK CATEGORY II
   - EXPOSURE CATEGORY C
   - INTERNAL PRESSURE COEFFICIENT, Gcpi ±0.18
   - COMPONENTS & CLADDING NOT DESIGNED BY THE ENGINEER OF RECORD SHALL BE DESIGNED FOR THE WIND PRESSURES SHOWN ON THE COMPONENTS AND CLADDING DIAGRAM. WIND PRESSURES FOR LARGER TRIBUTARY AREAS MAY BE USED BASED ON DELEGATED DESIGN CALCULATIONS.
7. SEISMIC LOADS
   - RISK CATEGORY II
   - IMPORTANCE FACTOR, Ie 1.0
   - SITE CLASS D
   - MAPPED SPECTRAL RESPONSE...
     - Ss 0.083 g
     - S1 0.045 g
   - SPECTRAL RESPONSE COEFFICIENTS
     - SDS 0.089 g
     - SD1 0.072 g
   - SEISMIC DESIGN CATEGORY B
   - SEISMIC FORCE RESISTING SYSTEM ORDINARY REINFORCED MASONRY SHEAR WALLS
   - RESPONSE MODIFICATION FACTOR, R 2
   - RESPONSE COEFFICIENT, Cs 0.044
   - DESIGN BASE SHEAR Cs x (WEIGHT OF BUILDING)
   - ANALYSIS PROCEDURE EQUIVALENT LATERAL FORCE
8. SOIL DESIGN VALUES
   - REFERENCE GEOTECHNICAL REPORT
   - PEPARED BY TERRACON CONSULATANTS, INC DATED ***06/23/2002***
   - SOIL UNIT WEIGHT (γ) 120 PCF
   - ALLOWABLE SOIL BEARING PRESSURES
     - VERTICAL (NET) 3,000 PSF
9. COMPONENT DESIGN
   - WOOD ROOF TRUSSES
     - DEAD
       - TOP CHORD 10.0 PSF
       - BOTTOM CHORD 5.0 PSF
     - LIVE
       - BOTTOM CHORD 5.0 PSF
     - SNOW
       - TOP CHORD SEE NOTE 5
     - DEFLECTION CRITERIA
       - LL L/360
       - TL L/240

GENERAL REQUIREMENTS

1. THE CONTRACT DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INCLUDE THE METHOD OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO: BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, TEMPORARY STRUCTURES, AND PARTIALLY COMPLETED WORK. OBSERVATION VISITS TO THE SITE BY STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
2. GENERAL CONTRACTOR TO DISTRIBUTE ALL SHEETS IN THE SET TO SUBCONTRACTORS.
3. THE ARCHITECT AND/OR ENGINEER OF RECORD SHALL NOT HAVE CONTROL OVER OR BE IN CHARGE OF, AND SHALL NOT BE RESPONSIBLE IN ANY WAY FOR CONSTRUCTION MEANS, METHODS TECHNIQUES, SEQUENCES, OR PROCEDURES, OR FOR SAFETY OR SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH ANY CONSTRUCTION ACTIVITIES, SINCE THESE ARE SOLELY THE CONTRACTOR'S RESPONSIBILITY.
4. SUBMITTALS PREPARED BY SUBCONTRACTORS SHALL BE REVIEWED BY CONTRACTOR PRIOR TO SUBMITTING TO ARCHITECT/ENGINEER.
5. CONTRACTOR SHALL VERIFY DIMENSIONS AND CONDITIONS AT THE JOB SITE. ANY DISCREPANCIES BETWEEN THE CONDITIONS FOUND AND THOSE INDICATED IN THE CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ATTENTION OF ARCHITECT PRIOR TO PROCEEDING WITH THE WORK.
6. SEE DOCUMENTS FROM OTHER DISCIPLINES FOR FLOOR, WALL, AND ROOF OPENINGS, TRENCHES, PITS, PIPE SLEEVES, EQUIPMENT PADS, METAL PAN STAIRS, MISCELLANEOUS IRON, ETC.
7. DO NOT PLACE PIPES, DUCTS, CHASES, ETC. IN STRUCTURAL BEAM AND COLUMN MEMBERS. DO NOT CUT ANY STRUCTURAL MEMBER FOR PIPES, DUCTS, ETC., UNLESS NOTED OTHERWISE. NOTIFY STRUCTURAL ENGINEER WHEN DOCUMENTS BY OTHER DISCIPLINES SHOW OPENINGS, POCKETS, ETC. NOT INDICATED IN THE STRUCTURAL DRAWINGS BUT ARE LOCATED IN THE STRUCTURAL MEMBERS. CONTRACTOR SHALL OBTAIN PRIOR APPROVAL FROM STRUCTURAL ENGINEER FOR INSTALLATION OF SUCH PIPES, DUCTS, CHASES, ETC.
8. DETAILS LABELED "TYPICAL" ON THE STRUCTURAL DRAWINGS APPLY TO ALL SITUATIONS OCCURRING ON PROJECT THAT ARE THE SAME OR SIMILAR TO THOSE LOCATIONS SPECIFICALLY INDICATED. WHERE A DETAIL IS NOT INDICATED, THE DETAIL SHALL BE THE SAME AS FOR OTHER SIMILAR CONDITIONS.
9. CONTRACTOR DESIGNED ELEMENTS SHALL BE DESIGNED BY LICENSED PROFESSIONAL ENGINEERS REGISTERED IN THE STATE WHERE THE PROJECT IS LOCATED. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, DESIGN LOAD DATA, SUPPORT REACTIONS, AND CERTIFICATION THAT ELEMENTS WERE DESIGNED FOR LOADS SPECIFIED IN THE CONTRACT DOCUMENTS OR IN THE BUILDING CODE. ALL DOCUMENTS NOTED SHALL BE SEALED BY THE LICENSED ENGINEER. IF CRITERIA INDICATED ARE NOT SUFFICIENT, SUBMIT A WRITTEN REQUEST FOR ADDITIONAL INFORMATION TO THE ARCHITECT. THE FOLLOWING ELEMENTS AND THEIR CONNECTIONS SHALL BE CONTRACTOR DESIGNED:
   A. WOOD TRUSSES

CONCRETE

CODES:	
ACI 301	*SPECIFICATION FOR STRUCTURAL CONCRETE*
ACI MCP	*MANUAL OF CONCRETE PRACTICE*
ACI 318	*BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE*
ACI 318.1	*BUILDING CODE REQUIREMENTS FOR STRUCTURAL PLAIN CONCRETE*

MATERIALS (28 DAY COMPRESSIVE STRENGTH):	
FOOTINGS	f'c=3,000 PSI
INTERIOR SLAB ON GRADE	f'c=4,000 PSI
EXTERIOR SLAB ON GRADE (EXCLUDING SIDEWALKS)	f'c=5,000 PSI
FOUNDATION WALLS / GRADE BEAMS / PIERS	f'c=4,500 PSI
BEAMS / COLUMNS	f'c=4,000 PSI
CONCRETE ON METAL DECK	f'c=4,000 PSI
CONCRETE TOPPING	f'c=4,000 PSI

1. CONCRETE MIX DESIGN (INCLUDING AGGREGATE SIZE, WATER CEMENT RATIO, AIR ENTRAINMENT, ADMIXTURES, SLUMP AND HISTORY OF BREAK TESTS) SHALL BE SUBMITTED TO THE EOR FOR APPROVAL PRIOR TO THE COMMENCEMENT OF ANY WORK. CONCRETE SHALL BE NORMAL WEIGHT UNO.
2. MAXIMUM WATER/CEMENT RATIO PERMITTED SHALL BE 0.50 FOR INTERIOR SLABS ON GRADE, 0.45 FOR BELOW GRADE CONCRETE AND 0.40 FOR CONCRETE EXPOSED TO WATER AND DEICING CHEMICALS.
3. CONCRETE WHICH WILL BE EXPOSED TO THE WEATHER (INCLUDING FOUNDATION WALLS) SHALL HAVE AIR-ENTRAINING ADMIXTURE AS REQUIRED TO PROVIDE 6% ± 1% AIR ENTRAINMENT.
4. MAXIMUM AGGREGATE SIZE SHALL BE 3/4" FOR SLABS ON GRADE, WALLS, BEAMS & COLUMNS, 1" FOR FOOTINGS AND 3/8" FOR TOPPING SLABS. NORMAL WEIGHT AGGREGATE TO CONFORM TO ASTM C33, LIGHTWEIGHT AGGREGATE TO CONFORM TO ASTM C330.
5. CONCRETE SHALL BE EVALUATED ACCORDING TO METHOD 1 OR METHOD 2 AS DESCRIBED IN ACI 301. THE RESULTS OF THESE ANALYSES SHALL BE SUBMITTED TO THE EOR FOR APPROVAL PRIOR TO ANY WORK.
6. THE CONTRACTOR SHALL MAKE PROVISIONS TO ALLOW AN INDEPENDENT TESTING AGENCY TO CAST 4 TEST CYLINDERS FOR EACH 50 CUBIC YARDS OF CONCRETE PLACED, OR FOR ANY DAY'S OPERATION. THE TESTING AGENCY SHALL BE RESPONSIBLE FOR CASTING AND CURING SPECIMENS IN COMPLIANCE TO ASTM C31 AND CASTING TESTING SPECIMENS IN COMPLIANCE TO ASTM C39.
7. DRAWINGS SHOWING THE LOCATION OF CONSTRUCTION JOINTS, CONTROL JOINTS, AND PLACING SEQUENCE SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THE PREPARATION OF REINFORCING SHOP DRAWINGS. MAXIMUM POUR LENGTHS OF WALLS TO BE 40'-0" AND A MINIMUM OF 4'-0" AWAY FROM INTERSECTIONS AND CORNERS.
8. GROUT USED TO SET PLATES SHALL BE NON-SHRINK AND NON-METALLIC.
9. THE CONTRACTOR SHALL USE SMOOTH FORMS FOR EXPOSED CONCRETE SURFACES. BOARD FORMS MAY BE USED FOR UNEXPOSED CONCRETE SURFACES. EARTH FORMS ARE FORBIDDEN.
10. PROVIDE A MINIMUM OF 6" OF COMPACTED GRANULAR FILL UNDER ALL SLABS ON GRADE.
11. VAPOR BARRIER TO BE 10 MILS THICKNESS MINIMUM, LAP MINIMUM 6" AND TAPE ALL SEAMS. VERIFY ADDITIONAL REQUIREMENTS WITH ARCHITECT.
12. FLOOR FLATNESS AND LEVELNESS OF SLAB ON GRADE CONCRETE SHALL HAVE THE FOLLOWING TOLERANCES, AS RECOGNIZED BY THE MOST CURRENT VERSION OF ASTM E 1155 AND ACI 302.1. SEE SPECIFICATION FOR FURTHER REQUIREMENTS (F(F) SPECIFIED OVERALL VALUE (SOV) OF 50, MINIMUM LOCALIZED VALUE (MLV) OF 25 AND F(L) SPECIFIED OVERALL VALUE (SOV) OF 33, MINIMUM LOCALIZED VALVE (MLV) OF 17).

SPREAD FOUNDATIONS

1. ALL FOUNDATIONS SHALL BE SUPPORTED ON APPROVED EXISTING SUBGRADE OR APPROVED COMPACTED STRUCTURAL FILL HAVING A MINIMUM ALLOWABLE BEARING CAPACITY AS INDICATED IN THE SOIL DESIGN VALUES.
2. SUBSURFACE CONDITIONS SHALL BE IMPROVED TO MEET CAPACITY WHEN REQUIRED, AS RECOMMENDED IN GEOTECHNICAL REPORT.
3. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE VALIDITY OF THE SUBSURFACE CONDITIONS DESCRIBED IN THE DRAWINGS, SPECIFICATIONS, TEST BORINGS OR GEOTECHNICAL REPORTS. THIS DATA IS INCLUDED TO ASSIST THE CONTRACTOR DURING BIDDING AND SUBSEQUENT CONSTRUCTION, AND TO REPRESENT CONDITIONS ONLY AT SPECIFIC LOCATIONS AT THE PARTICULAR TIME THE OBSERVATIONS WERE MADE.
4. ALL EXTERIOR FOUNDATIONS SHALL BEAR ON APPROVED SUBGRADE AT MINIMUM DEPTH OF 4'-0 BELOW ADJACENT FINISH EXTERIOR GRADE.
5. FOOTING ELEVATIONS SHOWN ON THE DRAWINGS REPRESENT ESTIMATED DEPTHS AND ARE NOT TO BE CONSTRUED AS LIMITING THE AMOUNT OF EXCAVATION REQUIRED TO REACH SUITABLE BEARING MATERIAL.
6. THE CONTRACTOR SHALL PROVIDE TEMPORARY SUPPORTS IN ALL EXCAVATIONS AS REQUIRED TO PREVENT HORIZONTAL MOVEMENT OR VERTICAL SETTLEMENT OF SURROUNDING SOIL AND/OR PROPERTY WHICH WILL ENDANGER LIVES OR PROPERTY.
7. THE CONTRACTOR SHALL PROVIDE CONTROL OF SURFACE AND SUBSURFACE WATER PROMPTLY TO ENSURE THAT ALL FOUNDATION WORK IS PERFORMED IN A DRY CONDITION.
8. FOUNDATIONS SHALL NOT BE PLACED ON FROZEN SUBGRADE.
9. THE CONTRACTOR SHALL PROTECT IN-PLACE FOUNDATIONS AND SLABS-ON-GRADE FROM FROST PENETRATION UNTIL THE PROJECT IS COMPLETE.
10. FOUNDATION WALLS SHALL BE BRACED DURING BACKFILLING AND COMPACTION OPERATIONS. BRACING SHALL BE LEFT IN PLACE UNTIL PERMANENT STRUCTURAL SUPPORT SYSTEM IS INSTALLED AND APPROVED BY THE ENGINEER.
11. WHERE FOUNDATION WALLS HAVE FILL ON BOTH SIDES, BACKFILLING SHALL BE DONE SIMULTANEOUSLY ON BOTH SIDES OF THE WALL.

CONCRETE REINFORCING

CODES:	
ACI 315	*DETAIL AND DETAILING OF CONCRETE REINFORCEMENT*
ACI 318	*BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE*
MSP2	*CRSI MANUAL OF STANDARD PRACTICE*
AWS D1.4	*STRUCTURAL WELDING CODE - REINFORCING STEEL*
WRI	*WELDED WIRE FABRIC MANUAL OF STANDARD PRACTICE*

MATERIALS:		
REINFORCING BARS	ASTM A615 Gr 60	Fy=60 KSI
WELDED WIRE FABRIC	ASTM A185	
MACRO FIBER REINFORCING	ASTM C1116 Type III	

1. THE REINFORCEMENT FABRICATOR SHALL PROVIDE AND SCHEDULE ON SHOP DRAWINGS ALL REQUIRED REINFORCING STEEL AND NECESSARY ACCESSORIES TO HOLD REINFORCEMENT SECURELY IN PLACE AT THE CORRECT LOCATIONS.
2. THE REQUIRED CLEARANCE FOR REINFORCEMENT (UNO) SHALL BE 3" FOR CONCRETE PLACED DIRECTLY AGAINST EARTH, 2" (#6 & LARGER) AND 1 1/2" (#5 & SMALLER) FOR CONCRETE EXPOSED TO EARTH OR WEATHER, 1 1/2" (# 14 & LARGER) AND 3/4" (#11 & SMALLER) FOR CONCRETE NOT EXPOSED TO EARTH OR WEATHER.
3. THE CONTRACTOR SHALL REFER TO TYPICAL DETAILS SHOWN ON THE CONTRACT DRAWINGS FOR ADDITIONAL REINFORCING REQUIREMENTS.
4. WHERE REINFORCEMENT IS REQUIRED IN SECTIONS, REINFORCEMENT IS CONSIDERED TYPICAL WHERE EVER THE SECTION APPLIES.
5. WELDED WIRE FABRIC SHALL HAVE A MINIMUM OF 6" LAP AND BE TIED TOGETHER.
6. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OF COMPLETION OF REINFORCEMENT INSTALLATION AND ALLOW AT LEAST 24 HOURS BEFORE SCHEDULED CONCRETE PLACEMENT FOR THE ARCHITECT TO INSPECT REINFORCEMENT.

PREFABRICATED WOOD TRUSSES

CODES:	
TRUSS PLATE INSTITUTE	*DESIGN SPECIFICATIONS FOR LIGHT METAL PLATE CONNECTED WOOD TRUSSES*

1. THE WOOD TRUSS FABRICATOR SHALL SUBMIT CALCULATIONS TO THE ARCHITECT/ENGINEER FOR REVIEW PRIOR TO FABRICATION. THE CALCULATIONS MUST BE STAMPED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE LOCAL JURISDICTION.
2. THE WOOD TRUSSES SHALL BE ERECTED AND BRACED IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN "BRACING OF WOOD TRUSSES: COMMENTARY AND RECOMMENDATIONS".
3. ALL WOOD TRUSSES SHALL BE SUPPORTED BY DIRECT END BEARING ON WALLS, BEAMS, COLUMNS, OR JOIST HANGERS.
4. DESIGN LOADS FOR TRUSSES SHALL BE AS NOTED ON DRAWINGS.
5. DESIGN TRUSS MEMBERS FOR CONCENTRATED LOADS OF SPRINKLER PIPING AND OTHER MECHANICAL LOADS.

REINFORCED MASONRY

CODES:	
ACI 530.1/ASCE 6/TMS 602	*SPECIFICATION FOR MASONRY STRUCTURES*
ACI 530/ASCE 5/TMS 402	*BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES*

MATERIALS:		
CONCRETE MASONRY BLOCK	ASTM C-90	2,000 PSI
TYPE M/S MORTAR	ASTM C270	
GROUT (28 DAY STRENGTH)	ASTM C476	2,000 PSI
REINFORCING BARS	ASTM A615 Gr 60	Fy=60 KSI

1. THE REQUIRED MINIMUM 28 DAY COMPRESSIVE STRENGTH OF THE COMBINATION OF CONCRETE BLOCK, GROUT AND MORTAR ON THE NET AREA OF THE CONSTRUCTION (f'm) SHALL BE A MINIMUM OF 2,000 PSI.
2. ALL CONCRETE BLOCK MASONRY UNITS SHALL BE NORMAL WEIGHT.
3. ALL CONCRETE BLOCK MASONRY UNITS SHALL BE LAID IN RUNNING BOND, UNO.
4. MASONRY BLOCK CELLS CONTAINING VERTICAL REINFORCING SHALL BE GROUTED SOLID. FILLING CELLS WITH MORTAR IS UNACCEPTABLE.
5. ALL BOND BEAMS TO BE GROUTED SOLID.
6. THE BASE OF EACH CELL IN WHICH REINFORCING BAR IS PLACED MUST HAVE A CLEAN OUT HOLE.
7. VERTICAL REINFORCING BARS SHALL BE LAPPED PER SCHEDULE. MECHANICAL SPLICES MAY BE USED IN LIEU OF LAP SPLICES.
8. PROVIDE CONTINUOUS REINFORCED BOND-BEAMS IN ALL REINFORCED MASONRY WALLS AT THE TOP, AND AS REQUIRED IN THE CONTRACT DRAWINGS. BOND-BEAMS AT THE TOP OF THE WALL SHALL BE CONTINUOUS AT MASONRY CONTROL JOINTS. ALL OTHER BOND-BEAMS SHALL NOT BE CONTINUOUS AT MASONRY CONTROL JOINTS. BOND-BEAM REINFORCING SHALL EXTEND INTO AND BE CONTINUOUS WITH ALL INTERSECTING BOND-BEAMS.
9. REINFORCED MASONRY WALLS SHALL HAVE #9 GAUGE (LADDER TYPE) HORIZONTAL REINFORCING AT SPACING AS NOTED ON CONTRACT DRAWINGS, BUT AT A MAXIMUM OF 16" O.C. VERTICALLY.
10. FILL CORES OF MASONRY UNDER ALL BEARING PLATES. THE MINIMUM WIDTH SHALL BE 3 TIMES THE BEARING PLATE LENGTH FOR THREE COURSES BELOW BEARING, UNO.
11. BRACE ALL MASONRY WALLS DURING CONSTRUCTION AS REQUIRED TO RESIST WIND AND OTHER TEMPORARY LOADS UNTIL FINAL STRUCTURAL MEMBERS ARE INSTALLED.
12. PROVIDE BAR POSITIONERS ON ALL REINFORCING TO HOLD AND MAINTAIN PROPER REBAR LOCATIONS AND COVER DURING GROUTING.

STRUCTURAL WOOD CONSTRUCTION

CODES:	
NFPA	*NATIONAL DESIGN SPECIFICATIONS FOR WOOD CONSTRUCTION*
NFPA	*DESIGN VALUES FOR WOOD CONSTRUCTION*
AITC	*TIMBER CONSTRUCTION MANUAL, PART II, DESIGN SPECIFICATIONS*
APA	*US PRODUCT STANDARD PS 1-83 FOR CONSTRUCTION AND INDUSTRIAL PLYWOOD*
AFPA	*AMERICAN FOREST AND PAPER ASSOCIATION - MANUAL FOR ENGINEERED WOOD CONSTRUCTION*

MATERIALS:		SPECIES/GRADE
SAWN LUMBER	ASTM D1990-96A OR ASTM D245	
WALL STUDS		SPF STUD
COLUMNS		SPF No.1/No.2
JOISTS & BEAMS		SPF No.1/No.2
I-JOISTS	ASTM D5055	
LSL		
WALL STUDS		1.3E
HEADERS		1.3E
LVL	ASTM D5055	
WALL STUDS		
HEADERS		2600 Fb, 2.0E
PSL	ASTM D5055	
BEAMS		2.0E
COLUMNS		1.8E
GLUE-LAMINATED TIMBER	AITC A190.1 & ASTM D3737	DF BALANCED 24F -1.8E
WOOD PANELS (COMPOSITE, ORIENTED STRANDBOARD & PLYWOOD)	DOC PS 1 OR PS 2	APA RATED
PRESERVATIVE TREATED WOOD	AWPA STD U1 & M4	S. PINE No.2
FIRE-RETARDANT TREATED LUMBER	IBC 2303.2 ASTM E84 CLASS A	S. PINE No.2
TONGUE & GROOVE DECKING	AMERICAN FOREST AND PAPER ASSOCIATION WOOD CONSTRUCTION DATA 2	Fb=1000 PSI E=1.8 KSI

1. ALL WOOD SHALL HAVE A MAXIMUM MOISTURE CONTENT OF 15% PRIOR TO INSTALLATION. MOISTURE CONTENT SHALL BE DETERMINED PER ASTM D4442.
2. ALL WOOD SHALL BE PROTECTED FROM MOISTURE BEFORE INSTALLATION. ALL WOOD STORED AT THE BUILDING SITE SHALL BE ELEVATED 6" ABOVE THE GROUND AND COVERED WITH PLASTIC TARPAULINS.
3. ALL STRUCTURAL WOOD SHALL MEET OR EXCEED ALLOWABLE UNIT STRESSES AND/OR GRADE AS REQUIRED BY THE DRAWINGS.
4. JOISTS SHALL BE BRIDGED WITH 1" X 3" CROSS BRIDGING, OR EQUAL, AT INTERVALS NOT EXCEEDING 8' -0" O.C.
5. ALL WOOD PERMANENTLY EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND, MASONRY OR CONCRETE SHALL HAVE A PRESERVATIVE TREATMENT EQUAL TO 0.4 P.C.F RETENTION OF PRESSURE INJECTED PRESERVATIVE.
6. ALL JOISTS AND RAFTERS SHALL BE SUPPORTED BY DIRECT END BEARING ON WALLS, BEAMS OR JOIST HANGERS.
7. WOOD MEMBERS SHALL NOT BE IN DIRECT CONTACT WITH CONCRETE OR MASONRY WITHOUT BEING MADE OF NATURALLY DURABLE OR PRESERVATIVE TREATED WOOD UNLESS 1/2" AIR SPACE IS PROVIDED AROUND (TOP, SIDES, END) OF WOOD RAFTERS/JOISTS/GIRDERS; IMPERVIOUS MOISTURE BARRIER OR 1" ELEVATED BASE IS PROVIDED AT WOOD COLUMNS; IMPERVIOUS MOISTURE BARRIER IS PROVIDED AT SILL PLATES.
8. WOOD STRUCTURAL PANELS SHALL BE LAID WITH THE LONG PANEL DIRECTION PERPENDICULAR TO THE SUPPORTING MEMBERS, WITH ENDS STAGGERED.
9. WOOD STRUCTURAL PANELS SHALL BEAR THE APPROPRIATE GRADING STAMP BY THE REVIEWING AGENCY.
10. ALL NAILS GIVEN ON THE PLANS SHALL BE CONSIDERED "COMMON NAILS" UNLESS NOTED ON THE PLANS.
11. ALL FASTENERS FOR WOOD CONSTRUCTION CONNECTORS (JOIST HANGERS, ETC.) SHALL BE PROVIDED BY OR APPROVED BY THE CONNECTOR'S MANUFACTURER.
12. ALL FASTENERS AND WOOD CONSTRUCTION CONNECTORS IN CONTACT WITH PRESERVATIVE-TREATED OR FIRE TREATED WOOD SHALL BE STAINLESS STEEL.
13. ALL FASTENERS AND WOOD CONSTRUCTION CONNECTORS IN CONTACT WITH FIRE RETARDANT TREATED WOOD USED IN INTERIOR APPLICATIONS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. IN THE ABSENCE OF MANUFACTURER'S RECOMMENDATIONS FASTENERS AND WOOD CONSTRUCTION CONNECTORS SHALL BE STAINLESS STEEL OR HOT-DIPPED GALVANIZED STEEL.
14. ALL BOLTS AND LAG SCREWS SHALL CONFORM TO ASTM A307 OR HOT DIP GALV. WASHERS SHALL BE PROVIDED BETWEEN THE HEAD OR NUT AND THE WOOD SURFACE.
15. NO WOOD MEMBER SHALL BE CUT, NOTCHED, OR DRILLED WITHOUT THE SPECIFIC WRITTEN PERMISSION OF THE EOR.
16. THE GLUE-LAMINATED TIMBER FABRICATOR SHALL SUBMIT DRAWINGS AND CALCULATIONS, INCLUDING CONNECTIONS, TO THE ARCHITECT/ENGINEER FOR REVIEW PRIOR TO FABRICATION. THE CALCULATIONS MUST BE STAMPED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE LOCAL JURISDICTION.

STRUCTURAL STEEL

CODES:	
AISC	*SPECIFICATION FOR DESIGN, FABRICATION AND ERECTION OF STEEL FOR BUILDINGS*
AISC	*CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES*
AWS D1.1	*STRUCTURAL WELDING CODE - STEEL*
AISC	*STRUCTURAL STEEL DETAILING MANUAL*

MATERIALS:		
HOT ROLLED W & WT SHAPES	ASTM A992	Fy=50 KSI
ANGLES, CHANNELS & PLATES	ASTM A36	Fy=36 KSI
S + M SHAPES	ASTM A36	Fy=36 KSI
HP SHAPES	ASTM A572 Gr 50	Fy=50 KSI
STEEL PIPE	ASTM A53 Gr B	Fy=35 KSI
RECTANGULAR HSS	ASTM A500 Gr B	Fy=46 KSI
ROUND HSS	ASTM A500 Gr B	Fy=42 KSI
HIGH STRENGTH BOLTS	ASTM A325	
HEAVY HEX NUTS	ASTM A563	
HARDENED STEEL WASHERS	ASTM A436	
ANCHOR RODS	ASTM F1554 Gr 36	Fy=36 KSI
THREADED RODS	ASTM A36	Fy=36 KSI
HEADED STUD ANCHORS	ASTM A108	

1. PROVIDE 2 MIL THICKNESS RED OR GRAY OXIDE PRIMER ON ALL STEEL SURFACES (UNO).
2. ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED PER ASTM A123 AND FASTENERS HOT DIPPED GALVANIZED PER ASTM A153.
3. ANCHOR RODS SHALL BE PRESET WITH TEMPLATES.
4. LEVELING PLATES AND BEARING PLATES SHALL BE SET IN A FULL BED OF NON-SHRINK GROUT.
5. CONNECTIONS MAY BE BOLTED OR WELDED AT THE FABRICATORS OPTION. BOLTED CONNECTIONS SHALL BE A MINIMUM BOLT DIAMETER OF 3/4" (UNO), HIGH STRENGTH BOLTS IN SINGLE OR DOUBLE SHEAR (UNO) AND SIMPLE SHEAR CONNECTIONS SHALL BE CAPABLE OF END ROTATION PER AISC REQUIREMENTS FOR UNRESTRAINED MEMBERS.
6. THE MINIMUM FILLET WELD SIZE SHALL NOT BE LESS THAN 3/16" (UNO).
7. ALL WELDS SHALL USE WELD METAL CONFORMING TO E70XX AND CONFORMING TO AWS WELDING PROCEDURES AND STANDARDS.
8. ALL WELDS SHALL BE MADE BY AWS CERTIFIED WELDERS CERTIFIED IN THE POSITION IN WHICH THE WELD IS TO BE MADE.
9. THE ERECTION OF ANY STRUCTURAL STEEL MEMBERS SHALL NOT COMMENCE UNTIL ALL SUPPORTING CONCRETE/MASONRY ELEMENTS HAVE ATTAINED AT LEAST 75% OF THEIR INTENDED MINIMUM COMPRESSIVE STRENGTH.
10. THE CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SUPPORTS AS REQUIRED FOR THE SAFE ERECTION OF ALL STEEL. TEMPORARY BRACING SHALL REMAIN IN PLACE UNTIL PERMANENT BRACING HAS BEEN INSTALLED AND FLOOR SLAB CONCRETE HAS ATTAINED 75% OF ITS REQUIRED STRENGTH.
11. STRUCTURAL STEEL SHALL BE TRUE AND PLUMB BEFORE FINAL BOLTING OR WELDING OF CONNECTIONS.
12. THE CONTRACTOR SHALL NOT MODIFY OR CUT ANY STRUCTURAL STEEL WITHOUT WRITTEN APPROVAL FROM THE EOR.
13. THE CONTRACTOR SHALL FIELD TOUCH UP ALL ABRASIONS, BURNS, AND SIMILAR DEFECTS IN PAINT OF STRUCTURAL STEEL.
14. PROVIDE 1/4" CLOSURE/END PLATES FOR ALL OPEN ENDS OF HSS & PIPE MEMBERS.

POST- INSTALLED ANCHORS

1. THE DIAMETER, EMBEDMENT LENGTH AND TYPE OF ADHESIVE ANCHORS, EXPANSION ANCHORS, AND SCREW ANCHORS SHALL BE AS SPECIFIED ON THE DRAWINGS.
2. THE SUBSTITUTION OF OTHER MANUFACTURER'S SIMILAR PRODUCTS IS ALLOWED, PROVIDED THAT THE SIZE IS EQUAL TO, AND CAPACITY IN SHEAR AND UPLIFT ARE EQUAL TO OR GREATER THAN WHAT IS SPECIFIED ON THE DRAWINGS. THE COST OF REDESIGN OF SUCH SUBSTITUTIONS SHALL BE BORE BY THE CONTRACTOR.
3. INSTALLATION OF ANCHORS SHALL STRICTLY FOLLOW ALL MANUFACTURER'S WRITTEN INSTRUCTIONS AND SPECIFICATIONS. ALL DRILL HOLE PREPARATIONS SHALL BE FOLLOWED.
4. NO LOAD SHALL BE APPLIED TO ADHESIVE ANCHORS PRIOR TO THE FULL CURE TIME AS SPECIFIED BY THE MANUFACTURER.
5. TESTING OF 10% OF ALL INSTALLED ANCHORS IS REQUIRED. TESTED ANCHORS SHALL MEET THE MANUFACTURERS PROOF LOAD REQUIREMENTS AND/OR INSTALLATION TORQUE REQUIREMENTS. MALFUNCTIONING FASTENERS SHALL BE REPLACED.

STRUCTURAL SHEET INDEX

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Project Info. 22005

RIVERSIDE PARK RESTROOMS

NEW CONSTRUCTION

600 Labaree St
Watertown, WI

Sheet Title

GENERAL NOTES

Drawn by	Checked by
C4E	C4E

Revisions

No.	Date	Description
1	06.30.2023	Bid & Permit Set

2023-06-30 Bid & Permit Set

Sheet No.

S0.1

SHEARWALL SCHEDULE

MARK	BLOCKED/ UNBLOCKED	EXTERIOR SHEATHING		INTERIOR SHEATHING		
		TYPE	FASTENING	TYPE	FASTENING	SILL PLATE ANCHORS
SW1	BLOCKED	APA RATED 7/16"	8d (1 3/8" PEN MIN) @ 6/12	SEE ARCH	-	SIMPSON 1/4" Ø SDS HD SCREW @ 12" OC (3" PEN MIN) @ WOOD
SW2	BLOCKED	APA RATED 7/16"	8d (1 3/8" PEN MIN) @ 4/12	SEE ARCH	-	SIMPSON 1/4" Ø SDS HD SCREW @ 6" OC (3" PEN MIN) @ WOOD

NOTES:

1. SEE TYPICAL SHEARWALL DETAIL.
2. LETTER AFTER SHEARWALL DESIGNATION DENOTES ANCHORAGE TYPE, SEE SHEARWALL ANCHORAGE SCHEDULE.

SHEARWALL ANCHORAGE

LABEL	STRAP	HOLDOWN	THREADED ROD Ø	ENDPOST
A	-	DTT2Z	1/2"	(1) 2x

NOTE:

1. SEE TYPICAL HOLDOWN ANCHORAGE DETAIL FOR THREADED ROD EMBEDMENT LENGTH AND ANCHORAGE REINFORCING.
2. HOLDOWNS ONLY REQUIRED AT CONCRETE, USE STRAPS ELSEWHERE. SEE TYPICAL SHEARWALL DETAIL.
3. AT STRAPS, PROVIDE 1/2 OF SPECIFIED NAILS IN EACH END LENGTH. BETWEEN END LENGTHS, PROVIDE NAILS @ 6" ON CENTER.
4. IF SHEARWALL ENDS ARE UNALIGNED, CONTINUE END POST TO FOUNDATION AND PROVIDE HOLDOWN. IF SHEARWALL IS SUPPORTED BY BEAM, PROVIDE STRAPS AND WRAP AROUND BEAM.

CONCRETE SLAB ON GRADE SCHEDULE

MARK	SYSTEM DEPTH	CONCRETE SLAB			COMPACTED GRAVEL THICKNESS	REMARKS
		TYPE	THICKNESS	SLAB REINFORCING		
SOG 5	11"	NWC	5"	FORTA FERRO FIBER REINFORCING (3 LB/CY)	6"	SEE TYPICAL SLAB JOINT DETAIL

WOOD DECK/SHEATHING SCHEDULE

MARK	SYSTEM DEPTH	STRUCTURAL LAYER		TOPPING/OVERLAYMENT		REMARKS
		TYPE	THICKNESS	TYPE	THICKNESS	
WD062	5/8"	PLYWOOD/OSB WOOD SHEATHING	5/8"	-		PROVIDE SIMPSON PSC CLIPS AT PANEL EDGES

PIER SCHEDULE

MARK	DIMENSIONS			REINFORCING		REMARKS
	DIAMETER	WIDTH	DEPTH	VERTICAL	TIES	
P1		1'-0"	1'-0"	(4)-#6	#3 @1'-0" OC	

LINTEL SCHEDULE

MARK	LINTEL	JAMB REINF	LINTEL TYPE	REMARKS
L1	8" BOND BEAM W/ (2)-#5 CONT	(1) #5	A	
L2	16" BOND BEAM W/ (2)-#5 CON	(1) #5	A	

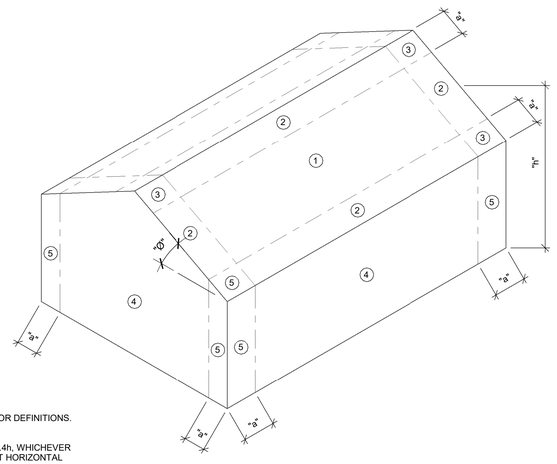
WOOD COLUMN SCHEDULE

MARK	SIZE	GRADE	TOP CONNECTION	BOTTOM CONNECTION	REMARKS
WC1	6X6 TIMBER	SPF No.1/No.2	CCQ	ABU	GALVANIZE CONNECTIONS WHEN EXPOSED TO WEATHER

WOOD HEADER SCHEDULE

MARK	SIZE	GRADE	JAMB STUDS	KING STUDS	REMARKS
H1	(3) 2x8	SPF	(1) 2x	(1) 2x	

ULTIMATE ROOF SURFACE PRESSURE (PSF)			
AREA (SF)	10.0	50.0	100.0
NEGATIVE ZONE 1	-27.0	-25.3	-24.5
NEGATIVE ZONE 2	-47.0	-38.3	-34.5
NEGATIVE ZONE 3	-69.5	-59.0	-54.5
POSITIVE ZONE 1	17.0	16.0	16.0
POSITIVE ZONES 2 & 3	-	-	-
OVERHANG ZONE 1 & 2	-55.0	-55.0	-55.0
OVERHANG ZONE 3	-92.5	-71.5	-62.5
ULTIMATE PARAPET SURFACE PRESSURE (PSF)			
AREA (SF)	10.0	50.0	100.0
CASE A: INTERIOR ZONE	0.0	0.0	0.0
CASE A: CORNER ZONE	0.0	0.0	0.0
CASE B: INTERIOR ZONE	0.0	0.0	0.0
CASE B: CORNER ZONE	0.0	0.0	0.0
ULTIMATE WALL SURFACE PRESSURE (PSF)			
AREA (SF)	10.0	100.0	200.0
NEGATIVE ZONE 4	-32.0	-27.6	-26.3
NEGATIVE ZONE 5	-39.5	-30.7	-28.0
POSITIVE ZONE 4 & 5	29.5	25.1	23.8



7° < Ø ≤ 45°

NOTE:
1. REFER TO "WIND LOADS AT COMPONENTS AND CLADDING" FOR DEFINITIONS.
(1) THROUGH (5) INDICATES WIND LOAD ZONES.
2. NOTATION:
"a" 10 PERCENT OF LEAST HORIZONTAL DIMENSION OR 0.4h, WHICHEVER IS SMALLER, BUT NOT LESS THAN EITHER 4" OF LEAST HORIZONTAL DIMENSION OR 3 FT.
"h" MEAN ROOF HEIGHT, IN FEET, EXCEPT THAT EAVE HEIGHT SHALL BE USED FOR Ø ≤ 10°
"Ø" ANGLE OF PLANE OF ROOF FROM HORIZONTAL, IN DEGREES.

1 / S0.2 COMPONENTS & CLADDING DIAGRAM

SCALE: 1" = 1'-0"

THRIVE ARCHITECTS

Architect
259 South Stree, Suite A
WAUKESHA, WI 53186
p: 833-380-6180

Project Info. 22005

RIVERSIDE PARK RESTROOMS

NEW CONSTRUCTION

600 Labaree St
Watertown, WI

Sheet Title

SCHEDULES

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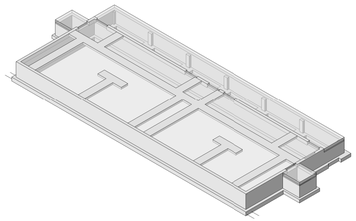
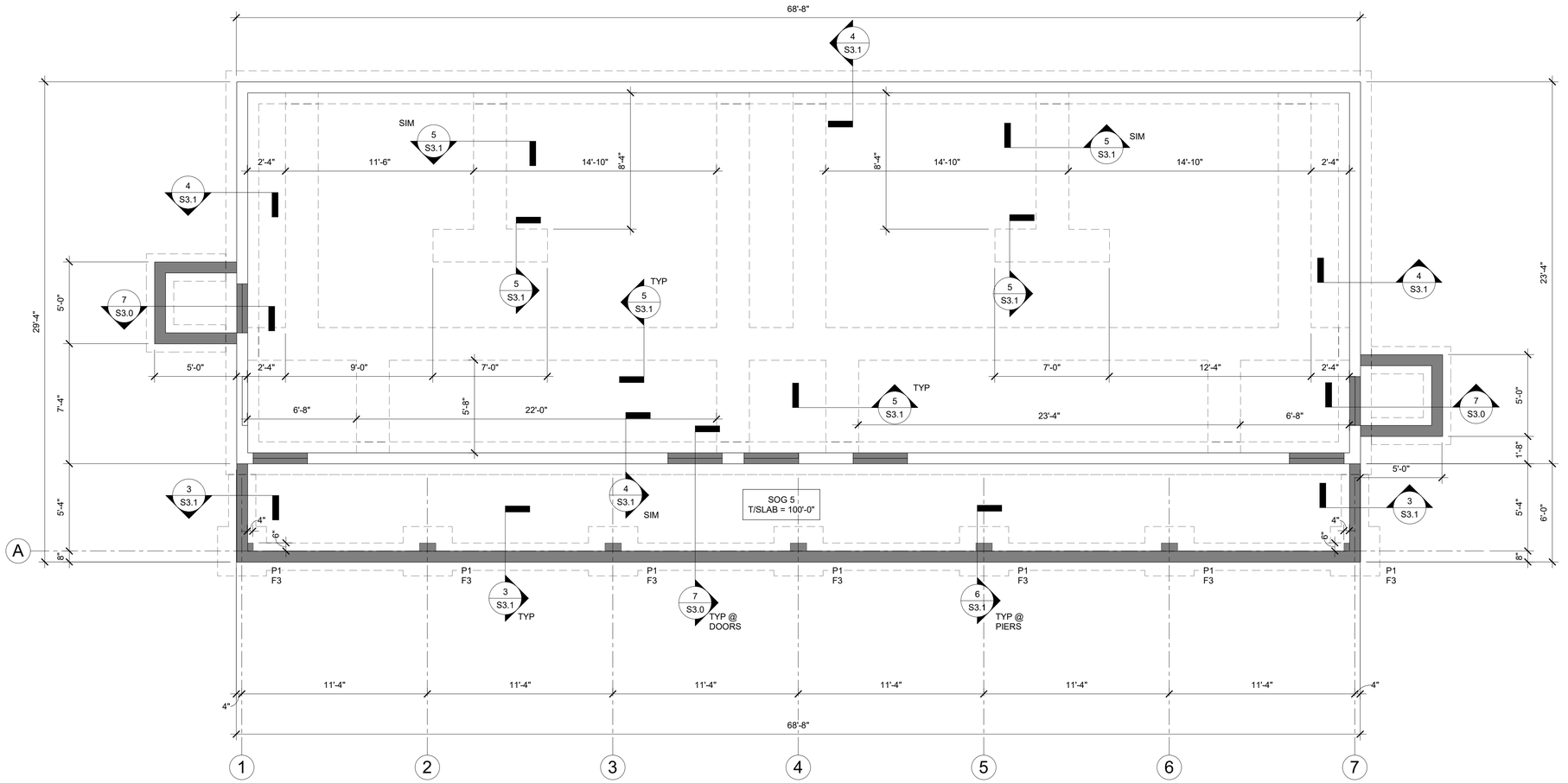


FOUNDATION PLAN NOTES:

1. SEE SHEET S0.1 FOR GENERAL NOTES AND S0.2 FOR SCHEDULES.
2. SEE SHEET S3.0.FOR FOUNDATION WALL CONSTRUCTION JOINTS AND TYPICAL REINFORCING DETAILS.
3. TOP OF EXTERIOR FOOTING ELEVATION = 96'-0" UNO.
4. TOP OF INTERIOR FOOTING ELEVATION = 100'-0" UNO.
5. TOP OF PIER ELEVATION = 99'-4" UNO.
6. TOP OF FOUNDATION WALL ELEVATION = 100'-0" UNO.
7. SEE MECHANICAL DRAWINGS FOR HOUSEKEEPING PADS REQUIRED FOR MECHANICAL EQUIPMENT.
8. SEE ARCHITECTURAL DRAWINGS FOR DOOR OPENING SIZES AND LOCATIONS IN WALLS.



1 S1.0 FOUNDATION PLAN

SCALE: 1/4" = 1'-0"

THRIVE ARCHITECTS

Architect

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RIVERSIDE PARK RESTROOMS

NEW CONSTRUCTION

600 Labaree St
Watertown, WI

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FOUNDATION PLAN

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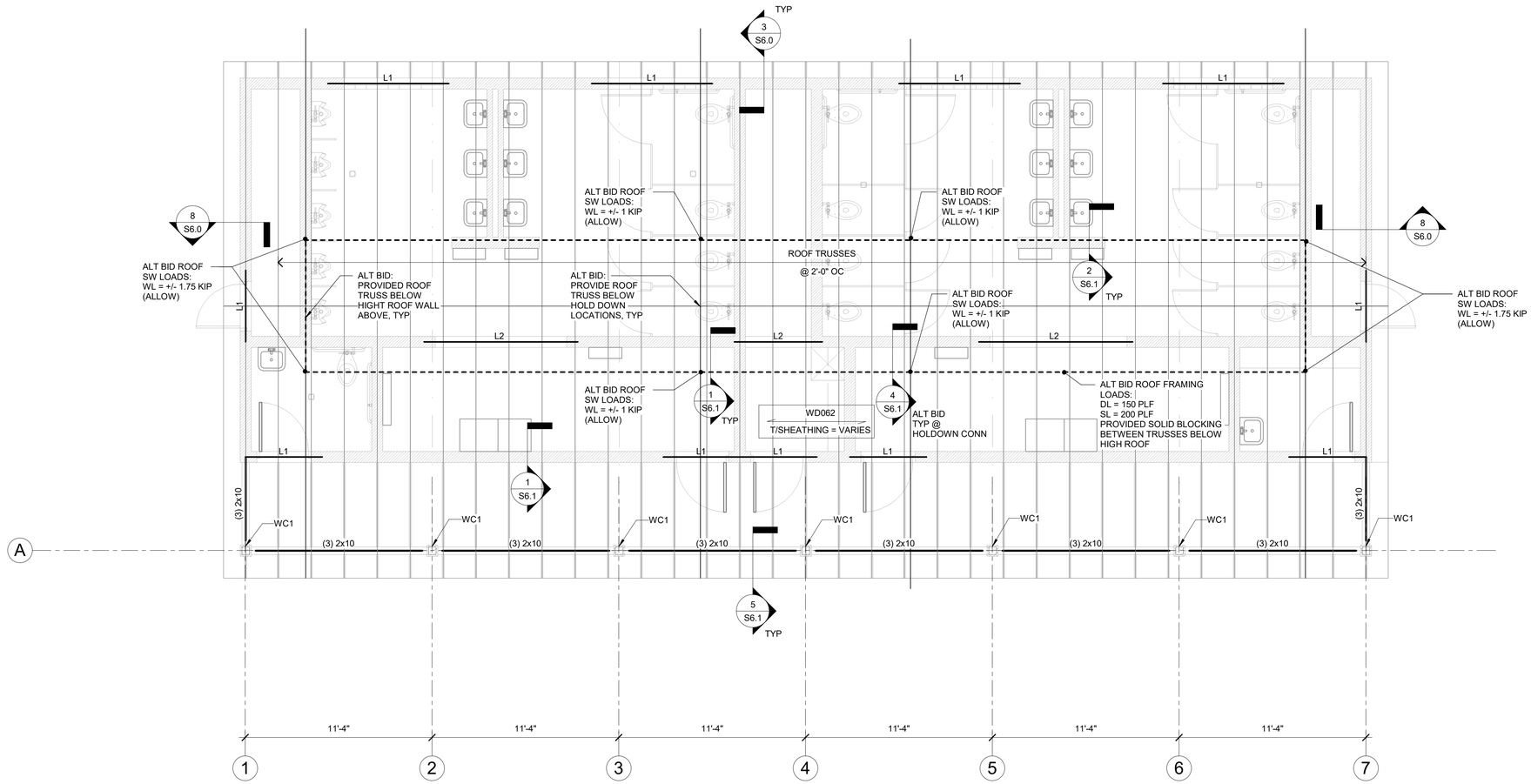
HIGH ROOF PLAN NOTES:

1. SEE SHEET S0.1 FOR GENERAL NOTES AND S0.2 FOR SCHEDULES.
2. SEE SHEET S4.0 FOR TYPICAL MASONRY SECTIONS AND DETAILS, INCLUDING TYPICAL WALL REINFORCING.
3. SEE SHEET S6.0 FOR TYPICAL WOOD SECTIONS AND DETAILS.
4. SEE ARCHITECTURAL DRAWINGS FOR TRUSS PROFILES, HEEL HEIGHTS, TRUSS BEARING ELEVATIONS AND ROOF SLOPES.
5. COORDINATE FINAL SIZE AND LOCATION OF OPENINGS, EQUIPMENT AND ROOF DRAINS WITH MECHANICAL AND PLUMBING CONTRACTORS.
6. ALL HEADERS AND BEAMS TO BE DROPPED UNO.
7. ALL WOOD STUD BEARING WALLS TO BE 2x6 SPF No.1/No.2 @ 16" OC.



1 S1.1 ROOF FRAMING PLAN

SCALE: 1/4" = 1'-0"

THRIVE ARCHITECTS

Architect

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RIVERSIDE PARK RESTROOMS

NEW CONSTRUCTION

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ROOF FRAMING PLAN

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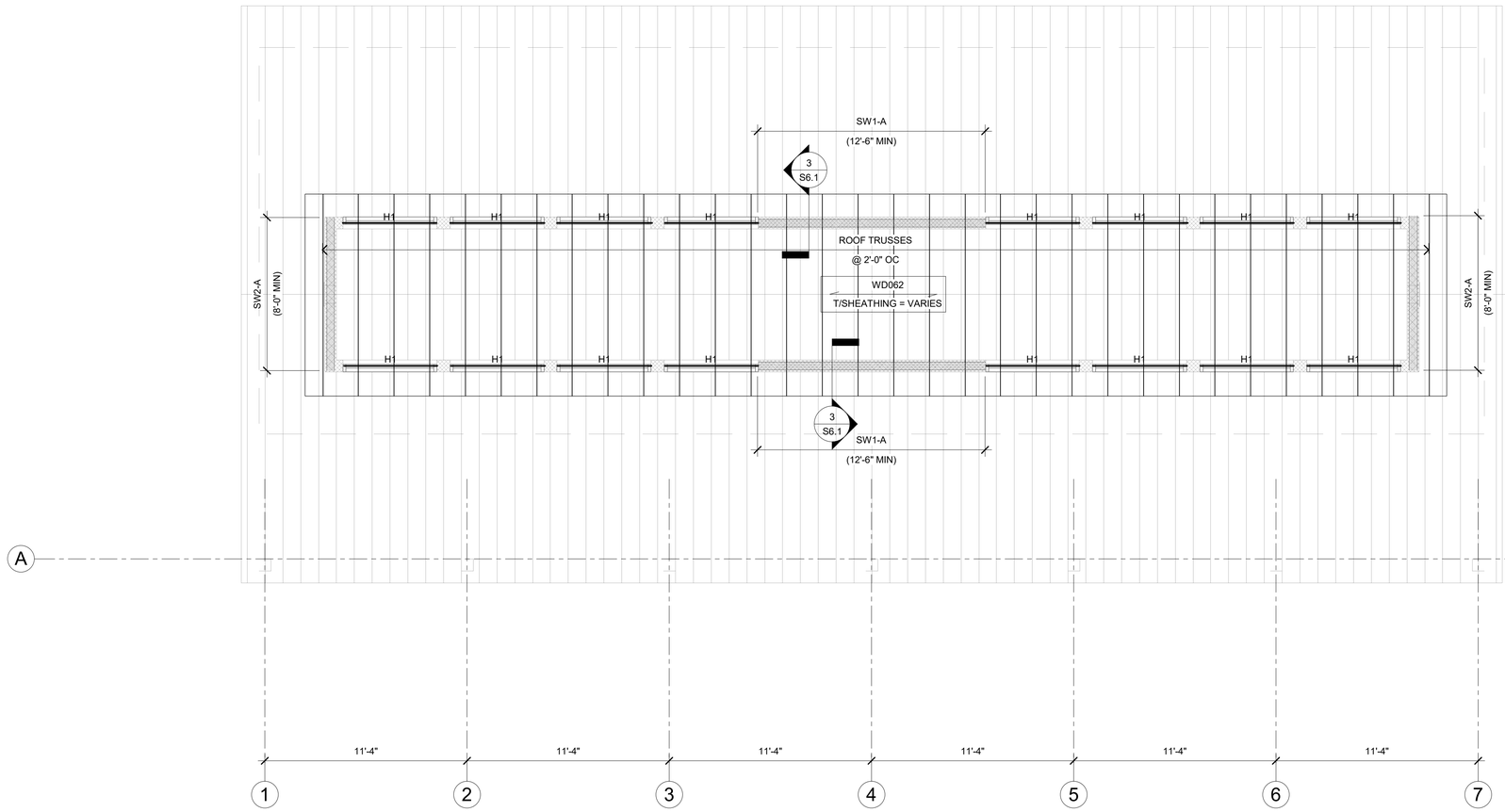
ROOF PLAN NOTES:

1. SEE SHEET S0.1 FOR GENERAL NOTES AND S0.2FOR SCHEDULES.
2. SEE SHEET S4.0 FOR TYPICAL MASONRY SECTIONS AND DETAILS, INCLUDING TYPICAL WALL REINFORCING.
3. SEE SHEET S6.0 FOR TYPICAL WOOD SECTIONS AND DETAILS.
4. SEE ARCHITECTURAL DRAWINGS FOR TRUSS PROFILES, HEEL HEIGHTS, TRUSS BEARING ELEVATIONS AND ROOF SLOPES.
5. COORDINATE FINAL SIZE AND LOCATION OF OPENINGS, EQUIPMENT AND ROOF DRAINS WITH MECHANICAL AND PLUMBING CONTRACTORS.
6. PROVIDE L1 LINTEL FOR ALL LOUVER OPENINGS. COORDINATE WITH ARCH & MEP FOR LOCATIONS AND SIZES.



1 / S1.2 HIGH ROOF FRAMING PLAN - ALTERNATE BID

SCALE: 1/4" = 1'-0"

THRIVE ARCHITECTS

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RIVERSIDE PARK RESTROOMS

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HIGH ROOF FRAMING PLAN

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REINFORCING LAP SPLICE LENGTH SCHEDULE										
f'c (PSI)	LOCATION	BAR SIZE								
		#3	#4	#5	#6	#7	#8	#9	#10	#11
3,000	TOP BARS	28	38	47	56	81	93	105	118	131
	OTHERS	22	29	36	43	63	72	81	91	101
4,000	TOP BARS	25	33	41	49	71	81	91	102	114
	OTHERS	19	25	31	37	54	62	70	79	87

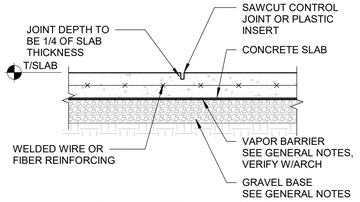
NOTES:
1. TABULATED VALUES ARE BASED ON GRADE 60 REINFORCING BARS AND NORMAL WEIGHT CONCRETE.
2. TENSION LAP SPLICE LENGTHS ARE CALCULATED PER ACI 318-14. LENGTHS ARE IN INCHES.
3. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
4. SPLICE LENGTHS IN THIS SCHEDULE ARE BASED ON CLEAR COVER AT LEAST 1.0 BAR Ø AND CLEAR SPACING AT LEAST 2.0 BAR Ø.

SECTION 1: SLAB-ON-GRADE NOTES
1. SLAB-ON-GRADE CONSTRUCTION SHOULD CONFORM WITH THE RECOMMENDATIONS AND REQUIREMENTS SET FORTH IN THE LATEST RELEASE OF ACI 302 GUIDE FOR CONCRETE FLOOR AND SLAB CONSTRUCTION.
2. REFER TO GEOTECHNICAL REPORT AND/OR ARCHITECTURAL DRAWINGS & SPECIFICATIONS FOR SUB-FLOOR DRAINAGE SYSTEM, SUBGRADE PREPARATION, MUD SLAB AND/OR VAPOR RETARDER REQUIREMENTS.
3. THE SUBGRADE SHALL BE FREE OF STANDING WATER AT THE TIME OF CONCRETE PLACEMENT.
4. REFER TO PLANS FOR SLAB THICKNESS ("T") AND REINFORCEMENT (WWF OR REINFORCEMENT BARS). REFER TO SPECIFICATIONS FOR FIBER REINFORCEMENT TO BE INCORPORATED IN CONCRETE MIX, IF ANY. WHERE PRESENT, REINFORCING BARS SHALL BE CHAIRED BY SOIL SUPPORTED SLAB BOLSTERS.
5. PROVIDE (2) #5 x 6'-0" AT ALL RE-ENTRANT CORNERS AND OTHER SIMILAR SLAB DISCONTINUITIES.
6. UNLESS SHOWN OTHERWISE ON THE DRAWINGS, PROVIDE CONTROL AND/OR CONSTRUCTION JOINTS AT EVERY COLUMN LINE AND IN BETWEEN THE COLUMNS SUCH THAT THE JOINT SPACING DOES NOT EXCEED 36 x ("T") UNO. THE RESULTING PANELS SHOULD BE APPROXIMATELY SQUARE.

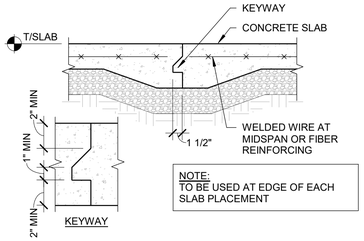
SECTION 2: CONSTRUCTION JOINT NOTES
1. BREAK THE BOND BETWEEN NEW AND PREVIOUSLY PLACES SLABS BY SPRAYING OR BY PAINTING THE EXPOSED SIDE OF THE JOINT WITH A CURING COMPOUND, ASPHALTIC EMULSION, OR FORM OIL.

SECTION 3: CONTROL JOINT NOTES
1. FOR SAW-CUT CONTROL JOINTS, MAKE THE SAW-CUT AS SOON AS THE SLAB IS ABLE TO SUPPORT THE WEIGHT OF WORKERS AND SAWING EQUIPMENT WITHOUT DAMAGE TO THE FINISHED SURFACE OF THE SLAB, BUT WITHIN 24 HOURS.
2. DEPTH OF SAW-CUT SHOULD BE 1 1/4" IF PRODUCED USING THE EARLY ENTRY DRY-CUT PROCESS AND "T"/4 (1" MIN) IF PRODUCED USING THE CONVENTIONAL WET-CUT PROCESS.
3. REFER TO SPECIFICATIONS REGARDING EPOXY RESIN OR ELASTOMERIC SEALANT REQUIREMENTS FILL CONTROL JOINTS.

SECTION 4: FORMED CONTROL JOINT OPTION NOTES
1. FORM CONTROL JOINTS BY INSERTING A PRE-MOLDED STRIP INTO THE FRESH CONCRETE UNTIL THE TOP SURFACE OF THE STRIP IS FLUSH WITH THE TOP SURFACE OF THE SLAB.
2. TOOL THE SLAB EDGES ROUND ON EACH SIDE OF THE INSERT, 1/8" MAX RADIUS.
3. AFTER THE CONCRETE HAS CURED, REMOVE THE INSERTS AND CLEAN THE GROOVE OF LOOSE DEBRIS.

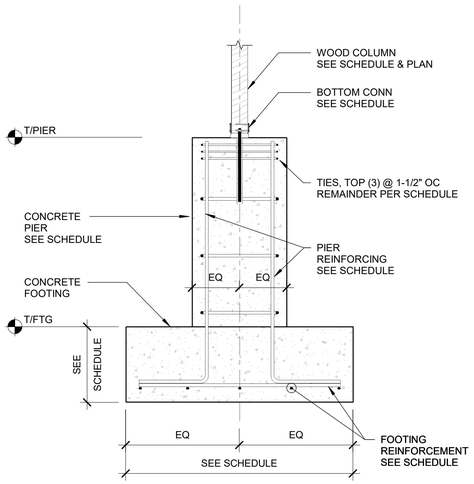


SLAB CONTROL JOINT



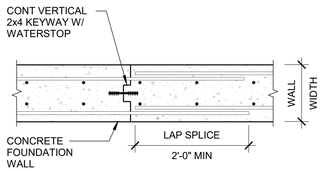
NOTE:
TO BE USED AT EDGE OF EACH SLAB PLACEMENT

SLAB CONSTRUCTION JOINT



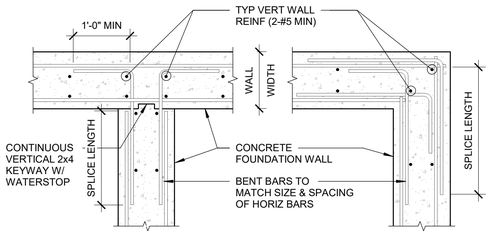
1 S3.0 TYPICAL CONCRETE REINFORCING LAP LENGTHS

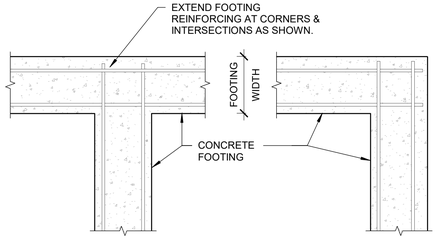
SCALE: NTS



2 S3.0 TYPICAL SLAB JOINTS

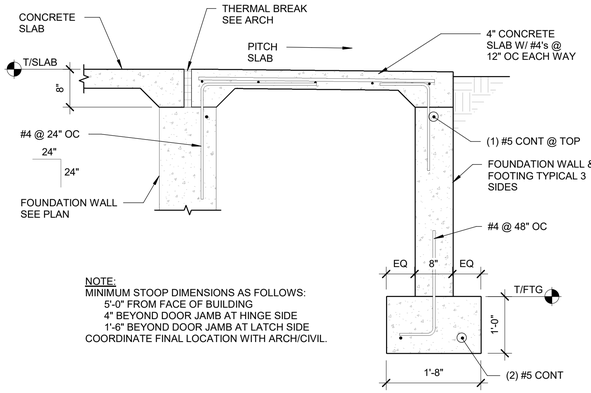
SCALE: NTS





3 S3.0 TYPICAL CONCRETE PIER DETAIL

SCALE: NTS



NOTE:
MINIMUM STOOP DIMENSIONS AS FOLLOWS:
5'-0" FROM FACE OF BUILDING
4" BEYOND DOOR JAMB AT HINGE SIDE
1'-6" BEYOND DOOR JAMB AT LATCH SIDE
COORDINATE FINAL LOCATION WITH ARCH/CIVIL.

4 S3.0 TYPICAL WALL CONSTRUCTION JOINT

SCALE: NTS

5 S3.0 TYPICAL WALL REINFORCING

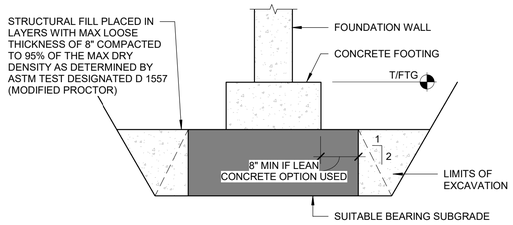
SCALE: NTS

6 S3.0 TYPICAL FOOTING REINFORCING

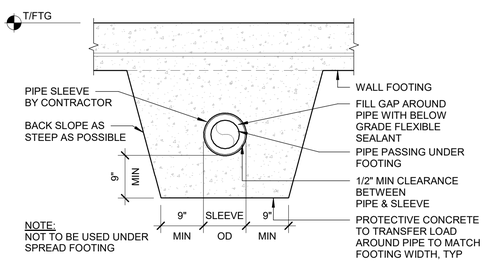
SCALE: NTS

7 S3.0 TYPICAL STOOP SECTION

SCALE: NTS

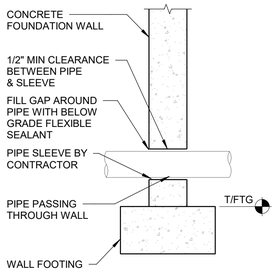


NOTES:
1. CONTRACTOR'S OPTION: ELIMINATE STRUCTURAL FILL BY LOWERING DESIGNED FOOTING ELEVATION SO THAT FOOTING RESTS DIRECTLY ON SUITABLE BEARING SUBGRADE. PROVIDE LEAN CONCRETE (Fc = 500 PSI MIN) UNDER THE FOOTING AS SHOWN HATCHED ABOVE, OR INCREASE FOOTING THICKNESS TO REACH SUITABLE BEARING SUBGRADE.
2. THIS DETAIL APPLIES ONLY AT THOSE LOCATIONS WHERE GEOTECH ENGINEER DEEMS SOILS AT DESIGNED FOOTING ELEVATIONS ARE INADEQUATE FOR FOOTING SUPPORT. WHERE THIS WORK IS REQUIRED, CONTRACTOR WILL BE COMPENSATED ON A PRE-ESTABLISHED UNIT COST AGREED UPON BY THE CONTRACTOR, ARCHITECT/ENGINEER, AND OWNER.

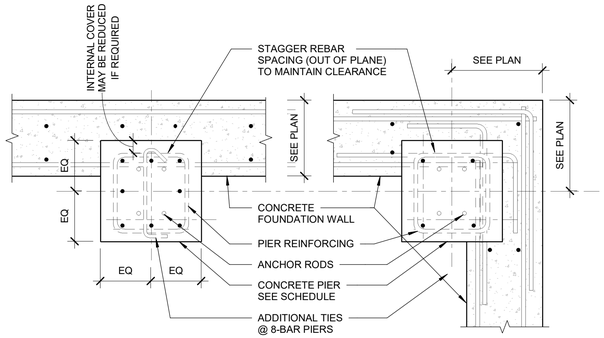


NOTE:
NOT TO BE USED UNDER SPREAD FOOTING

UNDER WALL FOOTING



THROUGH WALL



8 S3.0 TYPICAL OVER EXCAVATION DETAIL

SCALE: NTS

9 S3.0 TYPICAL PIPE CROSSING FOUNDATION WALL

SCALE: NTS

10 S3.0 TYPICAL PIER AT WALL AND CORNER

SCALE: NTS

THRIVE ARCHITECTS

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RIVERSIDE PARK RESTROOMS

NEW CONSTRUCTION

600 Labaree St
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Sheet Title

CONCRETE SECTIONS & DETAILS

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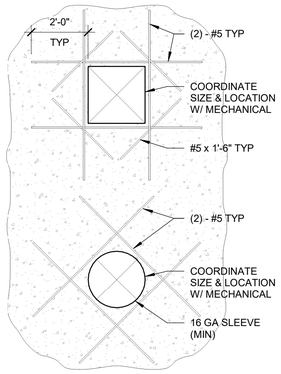
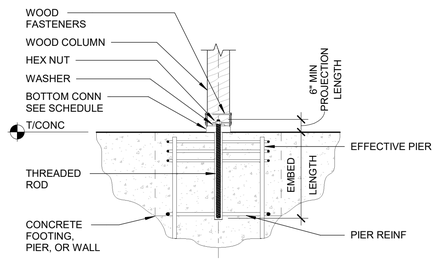


NOTES:

1. APPLIES TO 24" (MAX) OPENINGS THROUGH FOUNDATION WALL.
2. TOP OF OPENING TO BE 24" (MIN) FROM TOP OF WALL.
3. REINFORCING LAYERS TO MATCH FOUNDATION WALL.
4. USE 90° STANDARD HOOK AT CORNERS AND ENDS OF WALL.

1 S3.1 TYPICAL CONCRETE WALL PENETRATION

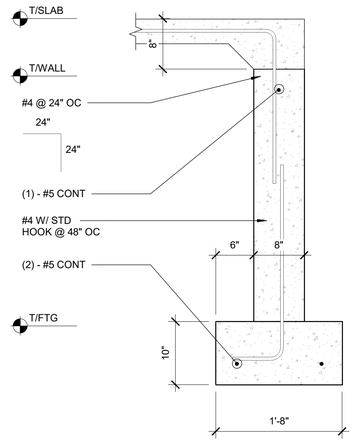
SCALE: NTS



CONN TYPE	WOOD FASTENERS	THREADED ROD Ø (IN.)	EMBED LENGTH (IN.)	EPOXY TYPE
SIMPSON ABA44	(6) - 10d	1/2	4 1/4	HILTI HIT-RE 500
SIMPSON ABA66	(8) - 16d	5/8	5	HILTI HIT-RE 500
SIMPSON ABU88	(18) - 16d	(2) - 5/8	6 5/8	HILTI HIT-RE 500

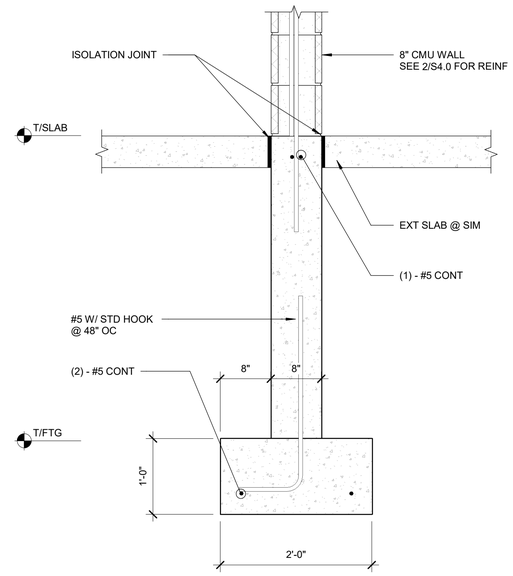
2 S3.1 TYPICAL WOOD COLUMN BASE

SCALE: NTS



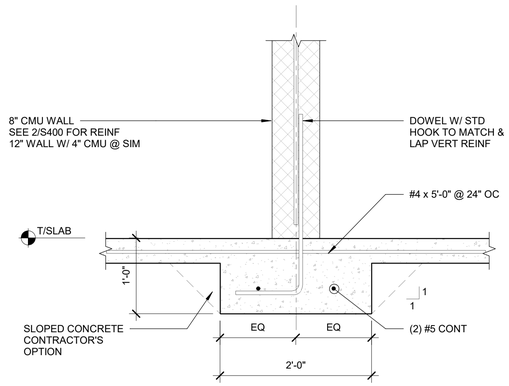
3 S3.1 SECTION

SCALE: NTS



4 S3.1 SECTION

SCALE: NTS



5 S3.1 SECTION

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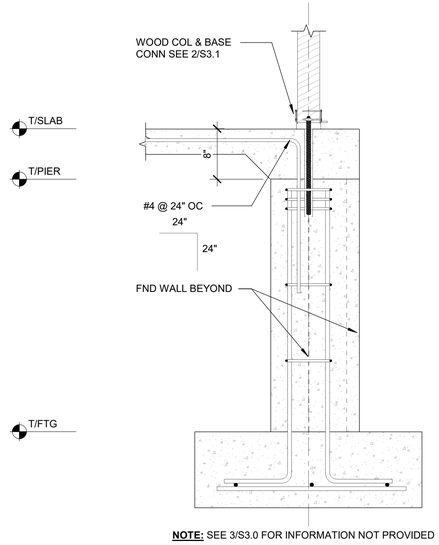

NOTE: SEE 3/S3.0 FOR INFORMATION NOT PROVIDED

6 S3.1 SECTION

SCALE: NTS

THRIVE ARCHITECTS

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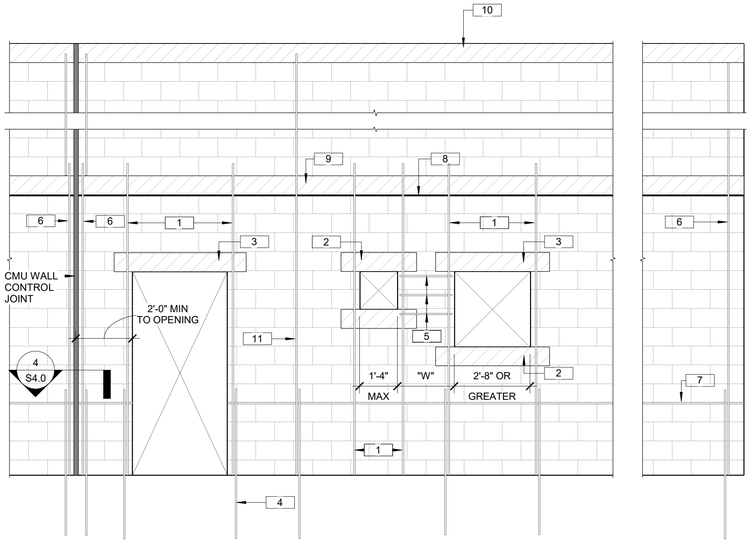
MASONRY BAR LAP LENGTHS (Ld) F'm = 2,000 psi

BAR SIZE	8" & 10" BLOCK CLEAR COVER ≥ 1 3/4"	12" BLOCK CLEAR COVER ≥ 2"	CENTERED IN 8" BLOCK	CENTERED IN 10" BLOCK	CENTERED IN 12" BLOCK
#3	15"	13"	8"	8"	8"
#4	25"	22"	13"	10"	10"
#5	39"	35"	20"	16"	13"
#6	MECH SP	MECH SP	38"	29"	24"
#7	MECH SP	MECH SP	MECH SP	40"	33"
#8	MECH SP	MECH SP	MECH SP	MECH SP	MECH SP
#9	NA	MECH SP	NA	MECH SP	MECH SP
#10	NA	MECH SP	NA	MECH SP	MECH SP
#11	NA	MECH SP	NA	NA	MECH SP

1 S4.0 TYPICAL MASONRY REINFORCING LAP LENGTHS

SCALE: NTS

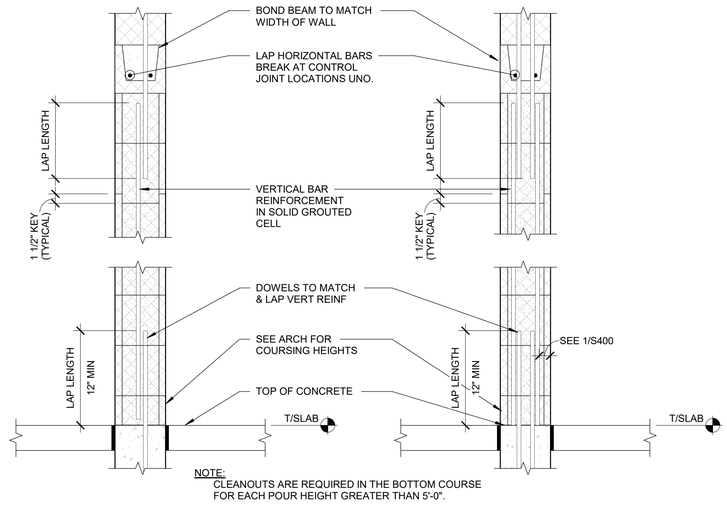


NOTES:

1. JAMB REINFORCEMENT PER LINTEL SCHEDULE OR LINTEL DETAILS. MIN (1) #5 EA JAMB.
2. 8" BOND BEAM W/ (1) #5 CONT.
3. LINTEL SEE SCHEDULE
4. DOWELS TO MATCH & LAP VERTICAL REINFORCEMENT.
5. WHEN "W" IS LESS THAN 2'-0" AT 8" CMU WALL AND 3'-0" AT 12" CMU WALL, ADD 1/4" CLOSED TIE SETS AT 8" OC.
6. REINFORCE VERT CELLS AT END OF WALL AND ADJACENT TO CONTROL JOINTS.
7. HORIZ JOINT REINFORCEMENT, SEE GENERAL NOTES.
8. ROOF OR FLOOR LINE BEYOND.
9. 8" BOND BEAM W/ (2) #4 CONT AT ROOF OR FLOOR LINE, UNO.
10. 8" BOND BEAM W/ (2) #4 CONT AT TOP OF WALL, UNO.
11. #5 @ 48" OC TYPICAL WALL REINFORCING, UNO,

2 S4.0 TYP CMU WALL REINFORCEMENT

SCALE: NTS



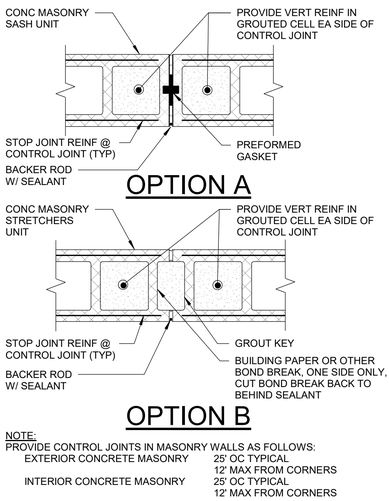
NOTE:
CLEANOUTS ARE REQUIRED IN THE BOTTOM COURSE FOR EACH POUR HEIGHT GREATER THAN 5'-0".

1 LAYER OF REINFORCING

2 LAYERS OF REINFORCING

3 S4.0 TYPICAL REINFORCED CMU WALL CONSTRUCTION DETAIL

SCALE: NTS



OPTION A

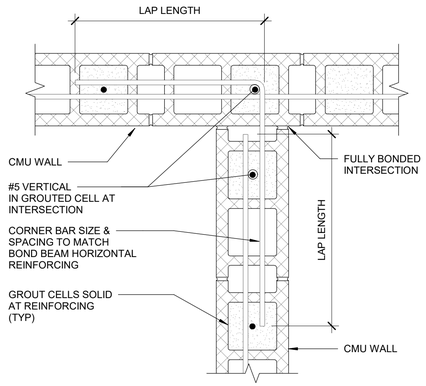
OPTION B

NOTE:
PROVIDE CONTROL JOINTS IN MASONRY WALLS AS FOLLOWS:

EXTERIOR CONCRETE MASONRY	25' OC TYPICAL 12' MAX FROM CORNERS
INTERIOR CONCRETE MASONRY	25' OC TYPICAL 12' MAX FROM CORNERS

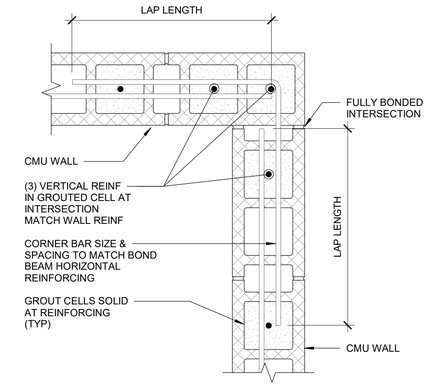
4 S4.0 CMU CONTROL JOINT

SCALE: NTS



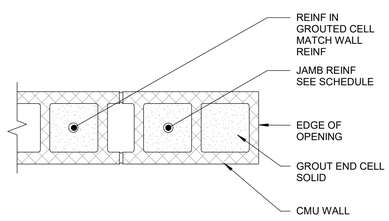
5 S4.0 CMU WALL INTERSECTION

SCALE: NTS



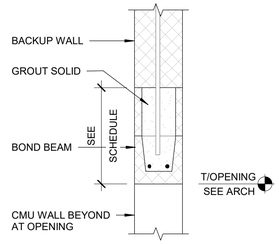
6 S4.0 CMU WALL CORNER

SCALE: NTS



7 S4.0 CMU WALL END

SCALE: NTS



A S4.0 LINTEL TYPE A

SCALE: NTS

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NEW CONSTRUCTION

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Watertown, WI

Sheet Title

MASONRY SECTIONS & DETAILS

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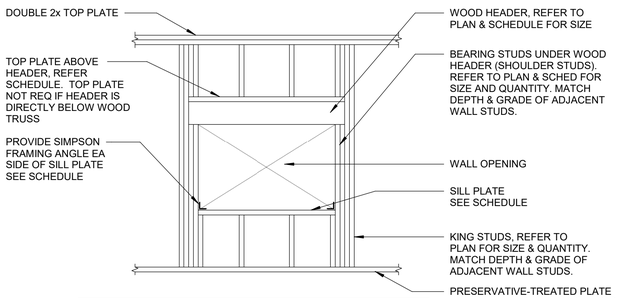
TYPICAL FASTENING SCHEDULE		
CONNECTION TYPE:	NAILING - COMMON NAILS: (UNLESS OTHER CONNECTION IS REQUIRED)	NAILING - STRIP NAILS: (UNLESS OTHER CONNECTION IS REQUIRED)
DOUBLE TOP PLATES, FACE NAIL DOUBLE TOP PLATES, LAP SPLICE, FACE NAIL TOP PLATES, LAPS & INTERSECTIONS, FACE NAIL	16d COMMON (3-1/2"x0.135") @ 16" OC (8) 16d COMMON (3-1/2"x0.162") (2) 16d COMMON (3-1/2"x0.162")	3"x0.131" @ 12" OC (12) 3"x0.131" (3) 3"x0.131"
TOP PLATE TO STUD, END NAIL CONT HEADER TO STUD, TOENAIL STUD TO SOLE PLATE	(2) 16d COMMON (3-1/2"x0.162") (4) 8d COMMON (2-1/2"x0.131") (4) 8d COMMON (2-1/2"x0.131"), TOENAIL OR (2) 16d COMMON (3-1/2"x0.162"), END NAIL	3"x0.131" -- (4) 3"x0131" TOENAIL (3) 3"x0.131" END NAIL
BUILT-UP STUD COLUMNS, FACE NAIL BUILT-UP CORNER STUDS & SUPPORT STUDS	10d COMMON (3"x0.148") @ 16" OC STAGGERED 16d COMMON (3-1/2"x0.162") @ 24" OC STAGGERED	3"x0.131" @ 12" OC STAGGERED 3"x0.131" @ 16" OC STAGGERED
BUILT-UP HEADER, FACE NAIL	16d COMMON (3-1/2"x0.162") @ 12" OC ALONG EACH EDGE	--
PLYWOOD/OSB ROOF SHEATHING (APA RATED) UNLESS NOTED OTHERWISE	8d COMMON (2-1/2"x0.131") @ 6" OC AT SUPPORTED PANEL EDGES 8d COMMON (2-1/2"x0.131") @ 12" OC AT INTERMEDIATE MEMBERS IN FIELD OF PANELS	3"x0.131" @ 6" OC AT SUPPORTED PANEL EDGES 3"x0.131" @ 12" OC AT INTERMEDIATE MEMBERS IN FIELD OF PANELS
JOIST TO SILL OR GIRDER, TOENAIL RIM JOIST TO TOP PLATE, TOENAIL BLOCKING BTWN JOIST/RAFTERS TO TOP PL, TOENAIL	(3) 8d COMMON (2-1/2"x0.131") 8d COMMON (2-1/2"x0.131") @ 6" OC (3) 8d COMMON (2-1/2"x0.131")	(3) 3"x0.131" 3"x0.131" @ 6" OC (3) 3"x0.131"
JOIST TO RIM BOARD, FACE NAIL SOLE PLATE TO JOIST/BLOCKING, FACE NAIL	(3) 16d COMMON (3-1/2"x0.162") 16d COMMON (3-1/2"x0.135") @ 16" OC	(4) 3"x0.131" 3"x0.131" @ 8" OC
FLOOR SHEATHING (APA RATED) UNLESS NOTED OTHERWISE	#8 SCREWS @ 6" OC AT SUPPORTED PANEL EDGES #8 SCREWS @ 12" OC AT INTERMEDIATE MEMBERS IN FIELD OF PANELS W/ CONSTRUCTION ADHESIVE	#8 SCREWS @ 6" OC AT SUPPORTED PANEL EDGES #8 SCREWS @ 12" OC AT INTERMEDIATE MEMBERS IN FIELD OF PANELS W/ CONSTRUCTION ADHESIVE

1 S6.0 TYPICAL WOOD FASTENING SCHEDULE

SCALE: NTS

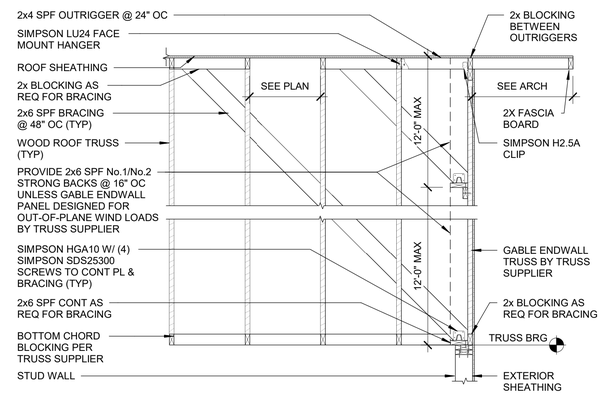


OPENING WIDTH	SILL PLATE SIZE	PLATE GRADE	FRAMING ANGLE
0'-0" TO 4'-0"	2x6	SPF STUD	-
4'-0" TO 8'-0"	2x6	SPF No.1/No.2	A35
8'-0" TO 11'-0"	1 3/4"x5 1/2"	2.0E LVL	A35
11'-0" TO 14'-0"	(2) 1 3/4"x5 1/2"	2.0E LVL	A35
14'-0" TO 16'-0"	(3) 1 3/4"x5 1/2"	2.0E LVL	A35

NOTE:
USE SIMPSON HH HEADER HANGER FOR HEADER CONNECTION TO WOOD COLUMNS.

4 S6.0 TYPICAL FRAMING AROUND AN OPENING IN A WOOD STUD BEARING WALL

SCALE: NTS

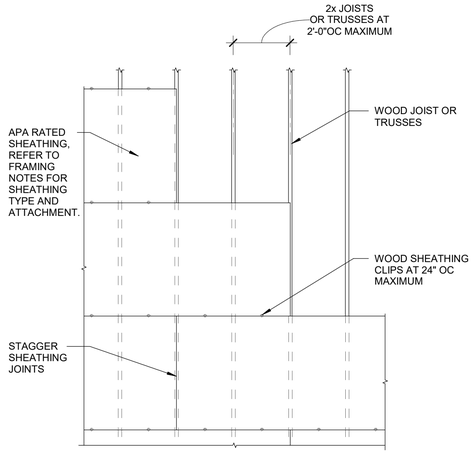


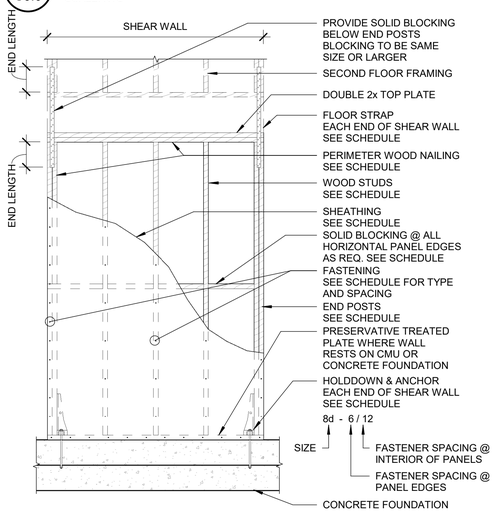
7 S6.0 TYPICAL GABLE END DETAIL - STUD WALL

SCALE: NTS

2 S6.0 TYPICAL WOOD ROOF DECK ATTACHMENT

SCALE: NTS

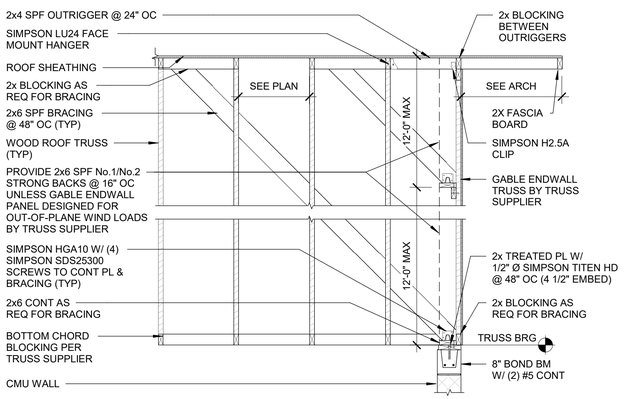




NOTES:
1. TYPICAL DETAILS SHOWN WITH PLYWOOD OR OSB SHEATHING. GYPSUM BOARD SHEAR WALLS SIMILAR, SEE SCHEDULE FOR FASTENERS AND SPACING.
2. CONTRACTOR OPTION: WOOD SHEATHING MAY BE ORIENTED W/ LONG DIMENSION VERTICAL-OPPOSITE WHAT IS SHOWN ON DETAIL.

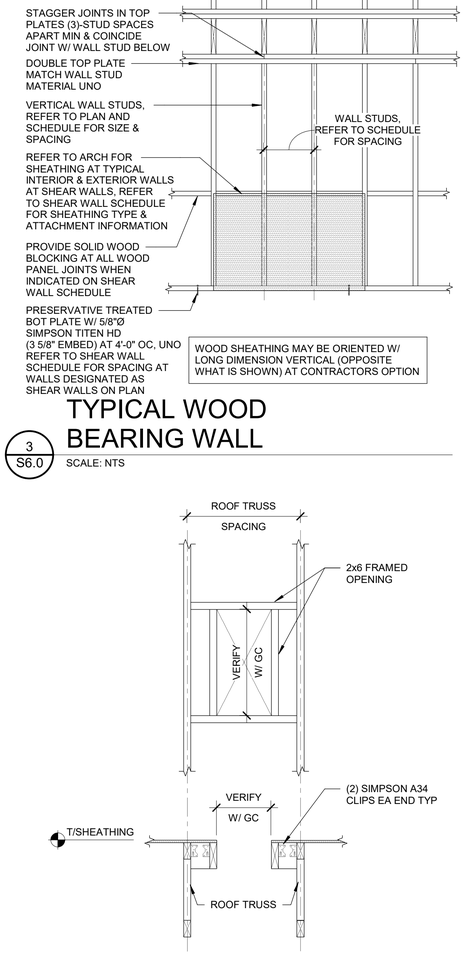
5 S6.0 TYPICAL WOOD SHEAR WALL

SCALE: NTS



8 S6.0 TYPICAL GABLE END DETAIL - CMU WALL

SCALE: NTS



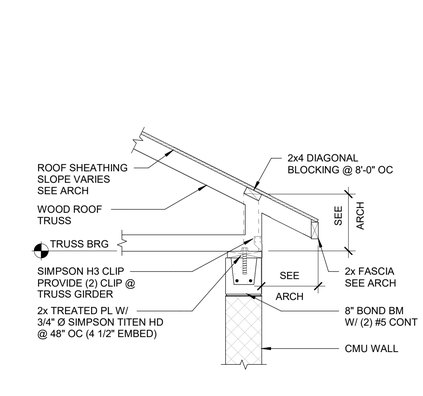
3 S6.0 TYPICAL WOOD BEARING WALL

SCALE: NTS

NOTES:
1. PROVIDE FRAMING FOR OPENINGS LARGER THAN 8" X 8", 8" Ø OR SUPPORTING EQUIPMENT IN EXCESS OF 50 LBS.
2. GENERAL CONTRACTOR TO COORDINATE FINAL SIZE AND LOCATIONS OF MECHANICAL AND PLUMBING OPENINGS.

6 S6.0 TYPICAL ROOF OPENING

SCALE: NTS



9 S6.0 SECTION

SCALE: NTS

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RIVERSIDE PARK RESTROOMS

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WOOD SECTIONS & DETAILS

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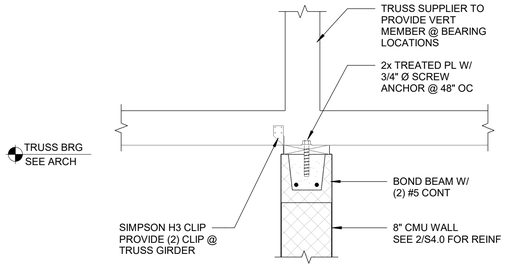
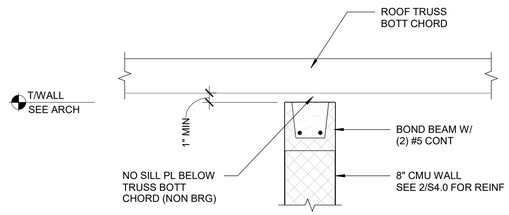
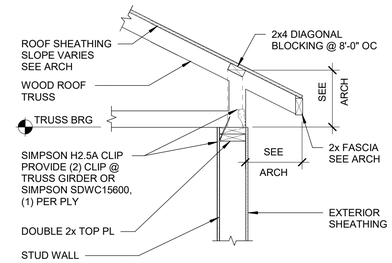


1 S6.1 SECTION
SCALE: NTS



2 S6.1 SECTION
SCALE: NTS



3 S6.1 SECTION
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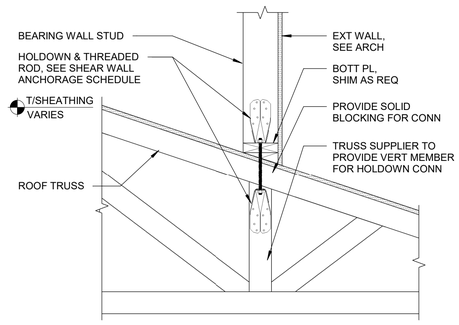
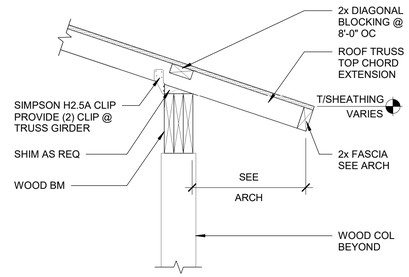


NOTE: SEE 1/S1.1 FOR TRUSS DESIGN LOADS

4 S6.1 SECTION
SCALE: NTS



5 S6.1 SECTION
SCALE: NTS

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