HIGHWAY WORK PROPOSAL

Wisconsin Department of Transportation
DT1502 01/2020 s.66.0901(7) Wis. Stats

Proposal Number: 002

COUNTY	STATE PROJECT	FEDERAL	PROJECT DESCRIPTION	HIGHWAY
Monroe	1071-07-79	WISC 2024351	Lacrosse - Sparta; Safety Rest Area 16 Sparta Building	IH 090

ADDENDUM REQUIRED

ATTACHED AT BACK

This proposal, submitted by the undersigned bidder to the Wisconsin Department of Transportation, is in accordance with the advertised request for proposals. The bidder is to furnish and deliver all materials, and to perform all work for the improvement of the designated project in the time specified, in accordance with the appended Proposal Requirements and Conditions.

Proposal Guaranty Required: $100,000.00 Payable to: Wisconsin Department of Transportation	Attach Proposal Guaranty on back of this PAGE.
Bid Submittal Date: May 14, 2024 Time (Local Time): 11:00 am	Firm Name, Address, City, State, Zip Code **SAMPLE** **NOT FOR BIDDING PURPOSES**
Contract Completion Time September 30, 2025	
Assigned Disadvantaged Business Enterprise Goal 2%	This contract is exempt from federal oversight.

This certifies that the undersigned bidder, duly sworn, is an authorized representative of the firm named above; that the bidder has examined and carefully prepared the bid from the plans, Highway Work Proposal, and all addenda, and has checked the same in detail before submitting this proposal or bid; and that the bidder or agents, officer, or employees have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this proposal bid.

Do not sign, notarize, or submit this Highway Work Proposal when submitting an electronic bid on the Internet.

Subscribed and sworn to before me this date _____

(Signature, Notary Public, State of Wisconsin)	(Bidder Signature)
(Print or Type Name, Notary Public, State Wisconsin)	(Print or Type Bidder Name)
(Date Commission Expires)	(Bidder Title)

Notary Seal

For Department Use Only

Type of Work:
Excavation, Base, Concrete Curb, Sidewalk, Storm Sewer, Fencing, Street Lighting, Plantings, Building Construction, Water Line.

Notice of Award Dated	Date Guaranty Returned

PLEASE ATTACH
PROPOSAL GUARANTY HERE

PROPOSAL REQUIREMENTS AND CONDITIONS

The bidder, signing and submitting this proposal, agrees and declares as a condition thereof, to be bound by the following conditions and requirements.

If the bidder has a corporate relationship with the proposal design engineering company, the bidder declares that it did not obtain any facts, data, or other information related to this proposal from the design engineering company that was not available to all bidders.

The bidder declares that they have carefully examined the site of, and the proposal, plans, specifications and contract forms for the work contemplated, and it is assumed that the bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the specifications, special provisions and contract. It is mutually agreed that submission of a proposal shall be considered conclusive evidence that the bidder has made such examination.

The bidder submits herewith a proposal guaranty in proper form and amount payable to the party as designated in the advertisement inviting proposals, to be retained by and become the property of the owner of the work in the event the undersigned shall fail to execute the contract and contract bond and return the same to the office of the engineer within fourteen (14) days after having been notified in writing to do so; otherwise to be returned.

The bidder declares that they understand that the estimate of quantities in the attached schedule is approximate only and that the attached quantities may be greater or less in accordance with the specifications.

The bidder agrees to perform the said work, for and in consideration of the payment of the amount becoming due on account of work performed, according to the unit prices bid in the following schedule, and to accept such amounts in full payment of said work.

The bidder declares that all of the said work will be performed at their own proper cost and expense, that they will furnish all necessary materials, labor, tools, machinery, apparatus, and other means of construction in the manner provided in the applicable specifications and the approved plans for the work together with all standard and special designs that may be designed on such plans, and the special provisions in the contract of which this proposal will become a part, if and when accepted. The bidder further agrees that the applicable specifications and all plans and working drawings are made a part hereof, as fully and completely as if attached hereto.

The bidder, if awarded the contract, agrees to begin the work not later than ten (10) days after the date of written notification from the engineer to do so, unless otherwise stipulated in the special provisions.

The bidder declares that if they are awarded the contract, they will execute the contract agreement and begin and complete the work within the time named herein, and they will file a good and sufficient surety bond for the amount of the contract for performance and also for the full amount of the contract for payment.

The bidder, if awarded the contract, shall pay all claims as required by Section 779.14, Statutes of Wisconsin, and shall be subject to and discharge all liabilities for injuries pursuant to Chapter 102 of the Statutes of Wisconsin, and all acts amendatory thereto. They shall further be responsible for any damages to property or injury to persons occurring through their own negligence or that of their employees or agents, incident to the performance of work under this contract, pursuant to the Standard Specifications for Road and Bridge Construction applicable to this contract.

In connection with the performance of work under this contract, the contractor agrees to comply with all applicable state and federal statutes relating to non-discrimination in employment. No otherwise qualified person shall be excluded from employment or otherwise be subject to discrimination in employment in any manner on the basis of age, race, religion, color, gender, national origin or ancestry, disability, arrest or conviction record (in keeping with s.111.32), sexual orientation, marital status, membership in the military reserve, honesty testing, genetic testing, and outside use of lawful products. This provision shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation, and selection for training, including apprenticeship. The contractor further agrees to ensure equal opportunity in employment to all applicants and employees and to take affirmative action to attain a representative workforce.

The contractor agrees to post notices and posters setting forth the provisions of the nondiscrimination clause, in a conspicuous and easily accessible place, available for employees and applicants for employment.

If a state public official (section 19.42, Stats.) or an organization in which a state public official holds at least a 10% interest is a party to this agreement, this contract is voidable by the state unless appropriate disclosure is made to the State of Wisconsin Ethics Board.

BID PREPARATION

Preparing the Proposal Schedule of Items

A. General

(1) Obtain bidding proposals as specified in section 102 of the standard specifications prior to 11:45 AM of the last business day preceding the letting. Submit bidding proposals using one of the following methods:

1. Electronic bid on the internet.
2. Electronic bid on a printout with accompanying diskette or CD ROM.
3. Paper bid under a waiver of the electronic submittal requirements.

(2) Bids submitted on a printout with accompanying diskette or CD ROM or paper bids submitted under a waiver of the electronic submittal requirements govern over bids submitted on the internet.

(3) The department will provide bidding information through the department's web site at:

https://wisconsindot.gov/Pages/doing-bus/contractors/hcci/bid-let.aspx

The contractor is responsible for reviewing this web site for general notices as well as information regarding proposals in each letting. The department will also post special notices of all addenda to each proposal through this web site no later than 4:00 PM local time on the Thursday before the letting. Check the department's web site after 5:00 PM local time on the Thursday before the letting to ensure all addenda have been accounted for before preparing the bid. When bidding using methods 1 and 2 above, check the Bid Express™ on-line bidding exchange at http://www.bidx.com/ after 5:00 PM local time on the Thursday before the letting to ensure that the latest schedule of items Expedite file (*.ebs or *.00x) is used to submit the final bid.

(4) Interested parties can subscribe to the Bid Express™ on-line bidding exchange by following the instructions provided at the www.bidx.com web site or by contacting:

Info Tech Inc.
5700 SW 34th Street, Suite 1235
Gainesville, FL 32608-5371
email: mailto:customer.support@bidx.com

(5) The department will address equipment and process failures, if the bidder can demonstrate that those failures were beyond their control.

(6) Contractors are responsible for checking on the issuance of addenda and for obtaining the addenda. Notice of issuance of addenda is posted on the department's web site at:

https://wisconsindot.gov/Pages/doing-bus/contractors/hcci/bid-let.aspx

or by calling the department at (608) 266-1631. Addenda can ONLY be obtained from the department's web site listed above or by picking up the addenda at the Bureau of Highway Construction, 4th floor, 4822 Madison Yards Way, Madison, WI, during regular business hours.

(7) Addenda posted after 5:00 PM on the Thursday before the letting will be emailed to the eligible bidders for that proposal. All eligible bidders shall acknowledge receipt of the addenda whether they are bidding on the proposal or not. Not acknowledging receipt may jeopardize the awarding of the project.

B. Submitting Electronic Bids

B.1 On the Internet

(1) Do the following before submitting the bid:

4. Have a properly executed annual bid bond on file with the department.
5. Have a digital ID on file with and enabled by Info Tech Inc. Using this digital ID will constitute the bidder's signature for proper execution of the bidding proposal.

(2) In lieu of preparing, delivering, and submitting the proposal as specified in 102.6 and 102.9 of the standard specifications, submit the proposal on the internet as follows:

1. Download the latest schedule of items reflecting all addenda from the Bid Express™ web site.
2. Use Expedite™ software to enter a unit price for every item in the schedule of items.
3. Submit the bid according to the requirements of Expedite™ software and the Bid Express™ web site. Do not submit a bid on a printout with accompanying diskette or CD ROM or a paper bid. If the bidder does submit a bid on a printout with accompanying diskette or a paper bid in addition to the internet submittal, the department will disregard the internet bid
4. Submit the bid before the hour and date the Notice to Contractors designates
5. Do not sign, notarize, and return the bidding proposal described in 102.2 of the standard specifications.

(3) The department will not consider the bid accepted until the hour and date the Notice to Contractors designates.

B.2 On a Printout with Accompanying Diskette or CD ROM

(1) Download the latest schedule of items from the Wisconsin pages of the Bid Express web site reflecting the latest addenda posted on the department's web site at:

https://wisconsindot.gov/Pages/doing-bus/contractors/hcci/bid-let.aspx

Use Expedite™ software to prepare and print the schedule of items. Provide a valid amount for all price fields. Follow instructions and review the help screens provided on the Bid Express™ web site to assure that the schedule of items is prepared properly.

(2) Staple an 8 1/2 by 11 inch printout of the Expedite□□ generated schedule of items to the other proposal documents submitted to the department as a part of the bidder's sealed bid. As a separate submittal, not in the sealed bid envelop but due at the same time and place as the sealed bid, also provide the Expedite™ generated schedule of items on a 3 1/2 inch computer diskette or CD ROM. Label each diskette or CD ROM with the bidder's name, the 4 character department-assigned bidder identification code from the top of the bidding proposal, and a list of the proposal numbers included on that diskette or CD ROM as indicated in the following example:

Bidder Name
BN00
Proposals: 1, 12, 14, & 22

(3) If bidding on more than one proposal in the letting, the bidder may include all proposals for that letting on one diskette or CD ROM. Include only submitted proposals with no incomplete or other files on the diskette or CD ROM.

(4) The bidder-submitted printout of the Expedite□□ generated schedule of items is the governing contract document and must conform to the requirements of section 102 of the standard specifications. If a printout needs to be altered, cross out the printed information with ink or typewriter and enter the new information and initial it in ink. If there is a discrepancy between the printout and the diskette or CD ROM, the department will analyze the bid using the printout information.

(5) In addition to the reasons specified in section 102 of the standard specifications, proposals are irregular and the department may reject them for one or more of the following:

1. The check code printed on the bottom of the printout of the Expedite™ generated schedule of items is not the same on each page.
2. The check code printed on the printout of the Expedite™ generated schedule of items is not the same as the check code for that proposal provided on the diskette or CD ROM.
3. The diskette or CD ROM is not submitted at the time and place the department designates.

B Waiver of Electronic Submittal

(1) The bidder may request a waiver of the electronic submittal requirements. Submit a written request for a waiver in lieu of bids submitted on the internet or on a printout with accompanying diskette or CD ROM. Use the waiver that was included with the paper bid document sent to the bidder or type up a waiver on the bidder's letterhead. The department will waive the electronic submittal requirements for a bidding entity (individual, partnership, joint venture, corporation, or limited liability company) for up to 4 individual proposals in a calendar year. The department may allow additional waivers for equipment malfunctions.

(2) Submit a schedule of items on paper conforming to section 102 of the standard specifications. The department charges the bidder a $75 administrative fee per proposal, payable at the time and place the department designates for receiving bids, to cover the costs of data entry. The department will accept a check or money order payable to: "Wisconsin, Dept. of Transportation."

(3) In addition to the reasons specified in section 102 of the standard specifications, proposals are irregular and the department may reject them for one or more of the following:

1. The bidder fails to provide the written request for waiver of the electronic submittal requirements.
2. The bidder fails to pay the $75 administrative fee before the time the department designates for the opening of bids unless the bidder requests on the waiver that they be billed for the $75.
3. The bidder exceeds 4 waivers of electronic submittal requirements within a calendar year.

(4) In addition to the reasons specified in section 102 of the standard specifications, the department may refuse to issue bidding proposals for future contracts to a bidding entity that owes the department administrative fees for a waiver of electronic submittal requirements.

PROPOSAL BID BOND

Wisconsin Department of Transportation

DT1303 1/2006

Proposal Number	Project Number	Letting Date
Name of Principal		
Name of Surety	State in Which Surety is Organized	

We, the above-named Principal and the above-named Surety, are held and firmly bound unto the State of Wisconsin in the sum equal to the Proposal Guaranty for the total bid submitted for the payment to be made; we jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. The condition of this obligation is that the Principal has submitted a bid proposal to the State of Wisconsin acting through the Department of Transportation for the improvement designated by the Proposal Number and Letting Date indicated above.

If the Principal is awarded the contract and, within the time and manner required by law after the prescribed forms are presented for signature, enters into a written contract in accordance with the bid, and files the bond with the Department of Transportation to guarantee faithful performance and payment for labor and materials, as required by law, or if the Department of Transportation shall reject all bids for the work described, then this obligation shall be null and void; otherwise, it shall be and remain in full force and effect. In the event of failure of the Principal to enter into the contract or give the specified bond, the Principal shall pay to the Department of Transportation **within 10 business days of demand** a total equal to the Proposal Guaranty as liquidated damages; the liability of the Surety continues for the full amount of the obligation as stated until the obligation is paid in full.

The Surety, for value received, agrees that the obligations of it and its bond shall not be impaired or affected by any extension of time within which the Department of Transportation may accept the bid; and the Surety does waive notice of any such extension.

IN WITNESS, the Principal and Surety have agreed and have signed by their proper officers and have caused their corporate seals to be affixed this date: **(DATE MUST BE ENTERED)**

PRINCIPAL

(Company Name) **(Affix Corporate Seal)**

(Signature and Title)

(Company Name)

(Signature and Title)

(Company Name)

(Signature and Title)

(Company Name)

(Signature and Title)

(Name of Surety) **(Affix Seal)**

(Signature of Attorney-in-Fact)

NOTARY FOR PRINCIPAL

(Date)

State of Wisconsin)
) ss.
_____ County)

On the above date, this instrument was acknowledged before me by the named person(s).

(Signature, Notary Public, State of Wisconsin)

(Print or Type Name, Notary Public, State of Wisconsin)

(Date Commission Expires)

Notary Seal

NOTARY FOR SURETY

(Date)

State of Wisconsin)
) ss.
_____ County)

On the above date, this instrument was acknowledged before me by the named person(s).

(Signature, Notary Public, State of Wisconsin)

(Print or Type Name, Notary Public, State of Wisconsin)

(Date Commission Expires)

Notary Seal

IMPORTANT: A certified copy of Power of Attorney of the signatory agent must be attached to the bid bond.

CERTIFICATE OF ANNUAL BID BOND

Wisconsin Department of Transportation

DT1305 8/2003

Time Period Valid (From/To)
Name of Surety
Name of Contractor
Certificate Holder Wisconsin Department of Transportation

This is to certify that an annual bid bond issued by the above-named Surety is currently on file with the Wisconsin Department of Transportation.

This certificate is issued as a matter of information and conveys no rights upon the certificate holder and does not amend, extend or alter the coverage of the annual bid bond.

Cancellation: Should the above policy be cancelled before the expiration date, the issuing surety will give thirty (30) days written notice to the certificate holder indicated above.

(Signature of Authorized Contractor Representative) (Date)

Effective with March 2010 Letting

LIST OF SUBCONTRACTORS

Section 66.0901(7), Wisconsin Statutes, provides that as a part of the proposal, the bidder also shall submit a list of the subcontractors the bidder proposes to contract with and the class of work to be performed by each. In order to qualify for inclusion in the bidder's list a subcontractor shall first submit a bid in writing, to the general contractor at least 48 hours prior to the time of the bid closing. The list may not be added to or altered without the written consent of the municipality. A proposal of a bidder is not invalid if any subcontractor and the class of work to be performed by the subcontractor has been omitted from a proposal; the omission shall be considered inadvertent or the bidder will perform the work personally.

No subcontract, whether listed herein or later proposed, may be entered into without the written consent of the Engineer as provided in Subsection 108.1 of the Standard Specifications.

Name of Subcontractor	Class of Work	Estimated Value

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS - PRIMARY COVERED TRANSACTIONS

Instructions for Certification

1. By signing and submitting this proposal, the prospective contractor is providing the certification set out below.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective contractor shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective contractor to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when the department determined to enter into this transaction. If it is later determined that the contractor knowingly rendered an erroneous certification in addition to other remedies available to the Federal Government the department may terminate this transaction for cause or default.

4. The prospective contractor shall provide immediate written notice to the department to whom this proposal is submitted if at any time the prospective contractor learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

6. The prospective contractor agrees by submitting this proposal that, should this contract be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department entering into this transaction.

7. The prospective contractor further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," which is included as an addendum to PR- 1273 - "Required Contract Provisions Federal Aid Construction Contracts," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. The contractor may rely upon a certification of a prospective subcontractor/materials supplier that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A contractor may decide the method and frequency by which it determines the eligibility of its principals. Each contractor may, but is not required to, check the Disapproval List (telephone # 608/266/1631).

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a contractor in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

1. The prospective contractor certifies to the best of its knowledge and belief, that it and its principals:

   (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

   (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property;

   (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offense enumerated in paragraph (1)(b) of this certification; and

   (d) Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective contractor is unable to certify to any of the statements in this certification, such prospective contractor shall attach an explanation to this proposal.

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STSP'S Revised January 5, 2024

SPECIAL PROVISIONS

1. General.

Perform the work under this construction contract for Project 1071-07-79, La Crosse – Sparta, Safety Rest Area 16 Sparta Building, IH 90, Monroe County, Wisconsin as the plans show and execute the work as specified in the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, 2024 Edition, as published by the department, and these special provisions.

If all or a portion of the plans and special provisions are developed in the SI metric system and the schedule of prices is developed in the US standard measure system, the department will pay for the work as bid in the US standard system.

100-005 (20240105)

2. Scope of Work.

The work under this contract shall consist of grading, base aggregate, storm sewer, HMA pavement, concrete pavement, concrete curb and gutter, permanent signing, pavement marking, lighting, plantings, landscaping, building, traffic control, and all incidental items necessary to complete the work as shown on the plans and included in the proposal and contract.

104-005 (20090901)

3. Prosecution and Progress.

Begin work within 10 calendar days after the engineer issues a written notice to do so.

Provide the start date to the engineer in writing within a month after executing the contract but at least 14 calendar days before the preconstruction conference. Upon approval, the engineer will issue the notice to proceed within 10 calendar days before the approved start date.

To revise the start date, submit a written request to the engineer at least two weeks before the intended start date. The engineer will approve or deny that request based on the conditions cited in the request and its effect on the department's scheduled resources.

Prior to construction, the department will remove all non-fixed items, including furniture, equipment, electronics, materials and supplies.

Winter Maintenance

After written notice to proceed, and prior to Final Acceptance of work, assist with the maintenance of roadways as specified in standard spec 104.6.1. Monroe County will perform snow removal operations along IH 90 for freeways and ramps open to traffic. Provide for snow removal along the Sparta Rest Area exit and entrance ramps to facilitate safe construction operations and as required to eliminate snow melt run-off from crossing IH 90 and ensure snow and ice are not tracked onto the IH 90 traffic lanes by construction vehicle traffic using the exit and entrance ramps during construction operations.

Northern Long-eared Bat *(Myotis septentrionalis)*

Northern long-eared bats (NLEB) have the potential to inhabit the project limits because they roost in trees, bridges and culverts. Roosts may not have been observed on this project, but conditions to support the species exist. The species and all active roosts are protected by the federal Endangered Species Act. If an individual bat or active roost is encountered during construction operations, stop work, and notify the engineer and the WisDOT Regional Environmental Coordinator (REC).

Ensure all operators, employees, and subcontractors working in areas of known or presumed bat habitat are aware of environmental commitments and avoidance and minimization measures (AMMs) to protect both bats and their habitat.

Direct temporary lighting, if used, away from wooded areas during the bat active season April 1 to October 31, both dates inclusive.

The department has contracted with others and will perform the following operations after October 31 and prior to April 1:

- Cutting down and removing trees.

Contractor means and methods to remove additional trees will not be allowed. If it is determined that additional trees with a 3-inch or greater diameter at breast height (dbh) need to be removed beyond contractor means and methods, notify the engineer to coordinate with the WisDOT REC to determine if consultation with United States Fish and Wildlife Service (USFWS) is required. The contractor must be aware that the WisDOT REC and/or USFWS may not permit modifications.

Work Restrictions

Excavation material and cleared and grubbed material shall be stockpiled on upland areas an adequate distance away from wetlands, storm sewer inlets, floodplains, and the waterways as determined by the engineer.

4. Traffic.

A General

Place PCMS at least 7 days in advance of closure per plan.

IH 90 shall remain open with two lanes in each direction at all times. Conduct work operations in a manner that causes the least disruption to traffic movements on IH 90. Do not directly cross, unload materials from, stop in or otherwise interfere with traffic in any lane or ramp that is open to traffic with construction equipment, vehicles, or construction materials. All access to IH 90 by construction equipment will be at existing interchange locations.

Provide the engineer with a hauling plan prior to the preconstruction conference. Include the proposed locations of points of entry and traffic control to be used. Obtain approval from the engineer for all arrangements for handling traffic during construction operations.

Flagging operations will not be permitted on IH 90.

Do not use maintenance crossings connecting eastbound and westbound roadways of IH 90 during construction operations.

Construction traffic cannot travel counter-directional adjacent to IH 90 through traffic.

Equip all construction vehicles and equipment entering or leaving live traffic lanes with a hazard identification beam (flashing yellow signal). The beam shall be activated when merging into or exiting a live traffic lane.

Have available at all times experienced personnel to promptly install, remove, and reinstall the required traffic control devices to route traffic in order to perform the necessary construction operations.

Do not park or store any equipment, vehicles, or construction materials within the median of IH 90.

Notification of Emergency and Local Officials

Notify the following parties at least 3 days (72 hours) in advance of any traffic change:

- Wisconsin State Patrol
- Monroe County Sheriff’s Office
- Monroe County Emergency Management
- Monroe County Highway Department
- La Crosse County Sheriff Department
- La Crosse County Emergency Services
- La Crosse County Highway Department

5. Holiday and Special Event Work Restrictions.

Do not perform work on, nor haul materials of any kind along or across any portion of the highway carrying IH 90 traffic, and entirely clear the traveled way and shoulders of such portions of the highway of equipment, barricades, signs, lights, and any other material that might impede the free flow of traffic during the following holiday and special event periods:

- From noon Friday, June 28, 2024 to 6:00 AM Monday, July 8,2024 for Independence Day;
- From noon Friday, August 30, 2024 to 6:00 AM Tuesday, September 3, 2024 for Labor Day;
- From noon Friday, November 22, 2024 to 6:00 AM Monday, November 25,2024 for Deer Hunting;
- From noon Wednesday, November 27, 2024 to 6:00 AM Monday, December 2, 2024 for Thanksgiving Day;
- From noon Friday, December 20, 2024 to 6:00 AM Thursday, December 26, 2024 for Christmas;
- From noon Tuesday, December 31, 2024 to 6:00 AM Thursday, January 2, 2025 for New Year's Day;
- From noon Friday, May 23, 2025 to 6:00 AM Tuesday, May 27, 2025 for Memorial Day;
- From noon Thursday, July 3, 2025 to 6:00 AM Monday, July 7, 2025 for Independence Day;
- From noon Friday, August 29, 2025 to 6:00 AM Tuesday, September 2, 2025 for Labor Day.

stp-107-005 (20210113)

6. Utilities.

This contract comes under the provision of Administrative Rule Trans 220.

Some of the utility work described below is dependent on prior work being performed by the contractor at a specific site. In such situations, provide the engineer and the affected utility a good faith notice of when the utility is to start work at the site. Provide this notice 14 to 16 calendar days in advance of when the prior work will be completed, and the site will be available to the utility owner. Follow-up with a confirmation notice to the engineer and the utility owner not less than three working days before the site will be ready for the utility owner to begin its work.

The utility work plan includes additional detailed information regarding the location of discontinued, relocated, or removed utility facilities. These can be requested during the bid preparation process or from the engineer after the contract has been awarded and executed.

stp-107-065 (20080501)

Brightspeed of Midwest Wisconsin – Communication has underground and overhead facilities within the project limits at the following locations:

- Station 1198+00 RA to 1202+00 RA, south side of Rest Area Ramp A
- Crossing Rest Area Ramp A at Station 1202+00 RA

Brightspeed to salvage existing equipment once the rest area is closed, prior to beginning of construction. Salvage expected to take three days. Existing buried copper cable on the site to be discontinued in place.

Rogers Telecom – Communication has underground facilities north of the project area to the north of the La Crosse & Milwaukee Rail Road Company railroad tracks.

No conflicts anticipated and no relocations required.

WIN Technology – Communication has underground facilities within the project limits at the following locations:

- Station 1159+40 WB to 1222+00 WB, north side of IH 90
- Crossing Rest Area Ramp A at Station 1181+50 RA
- Crossing Rest Area Ramp B at Station 1183+75 RB
- Crossing Rest Area Ramp A at Station 1207+40 RA

WIN to relocate existing fiber line south away from proposed dumpster pad at Station 1183+10 RB and lower existing fiber line at ditch crossing Station 1184+40 to Station 1185+00 RB during construction. Relocation to take approximately five working days.

Provide advance notice prior to beginning excavation within 50 feet of existing underground facilities**.**

Xcel Energy – Electricity has overhead and underground electric facilities within the project limits at the following locations:

- Station 1196+00 RA to 1206+75 RA, south side of Rest Area Ramp A
- Station 1206+75 RA to 1214+00 RA, north side of Rest Area Ramp A
- Crossing Rest Area Ramp A at Station 1206+75 RA

Xcel Energy will replace the existing service with a new service (one three-phase) during construction. Notify Xcel Energy once rough grading has been completed and conduits from the transformer location have been installed to schedule final installation and directional bore. Xcel anticipates it will take four days to bring the new three phase distribution to the new transformer location.

Provide advance notice prior to beginning excavation within 50 feet of existing underground electrical service.

Once the new three phase distribution line is brought in and energized, Xcel Energy will demo the existing one phase overhead line back to Iceberg Rd. Total time of construction for Xcel Energy work is anticipated to be 15 days.

7. Other Contracts 1071-07-80.

1071-07-80, La Crosse – Sparta, Safety Rest Area 16 - Site

Coordination with Project 1071-07-80 will be required. Project 1071-07-80 involves the removal of the existing rest area ramps, parking areas, and building, as well as the construction of the proposed rest area ramps and parking areas. Coordination with this project will be required for traffic control staging, lighting construction, FTMS construction, material/equipment delivery and storage, and site access and storage.

Project 1071-07-80 is scheduled to be let on June 11, 2024, and is anticipated to have a completion date contract of September 30, 2025. Project 1071-07-80 will be responsible for all required Traffic Control staging on IH 90 and the rest area ramps once that project begins work. The exact date and the transfer of the Traffic Control staging responsibility for the project area will need to be coordinated with the 1071-07-80 project.

Coordinate with Project 1071-07-80 to ensure that the proposed storm sewer pipe and endwall at Station 1188+87 RB is protected from equipment impact loadings until adequate cover can be established as directed by the engineer in the field.

Construction materials and equipment shall be stored within project boundary marked on plans once project 1071-07-80 begins work, unless written permission to store materials or equipment outside of this boundary is received from the engineer and 1071-07-80 contractor.

Invite Ryan Tichenor (rtichenor@handishop.org or (608)-343-7049) or approved alternate site representative to all weekly project update meetings.

Do not install concrete sidewalk or concrete driveway adjacent to the back of curb & gutter along the parking lots until the curb & gutter is completed with project 1071-07-80 (by others).

8. Work by Others – Utilities.

WisDOT Electric – Electricity has underground electric facilities within the project limits that will be replaced with the project.

9. Referenced Construction Specifications.

Building Construction shall conform to the Wisconsin Commercial Building Code, Chapter SPS-362 (based on 2015 International Building Code) and the 2010 ADA Standards for Accessible Design.

If there is a discrepancy or conflict between the referenced specifications and the standard specifications regarding contract administration, part 1 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, 2024 Edition governs.

10. New Utility Service Connections.

Coordinate all required utility work disconnections according to standard spec 107.22 and pay for the installation of new site utilities and tie-ins as may be necessary to complete the work as described below.

Include the following allowances for charges and work to be done by utilities in the total bid price for the appropriate items:

Electrical Service, Sparta Rest Area 16: Xcel Energy has existing service facilities connecting to the existing rest area facility coming into the site from the northeast near Iceberg Rd. Xcel Energy plans on providing new underground services to the proposed building location (one three-phase) coming into the site from across the interstate to the southeast. Xcel Energy will also reconnect service to the existing maintenance shed to the new service feed. Xcel Energy will require three days to complete the electric service installation from the existing right-of-way to the proposed Rest Area building during construction. Contact Nathan Abbott of Xcel Energy at (608) 789-3790 at least three weeks in advance of needing them onsite to coordinate electrical service installation efforts.

A service request and application have been submitted by the department. Contact Nathan Abbott to check on the status of the application upon award of the bid.

Coordinate temporary electrical service needs for construction with Nathan Abbott. Costs for temporary electrical service and electricity during construction will be the responsibility of the contractor.

Utility installation costs for electric service to the project site transformer location is to be paid for separately by the department.

11. Information to Bidders, U.S. Army Corps of Engineers Section 404 Permit.

The department has received written verification of coverage under the Section 404 Transportation Regional General Permit from the U.S. Army Corps of Engineers. Comply with the requirements of the permit in addition to requirements of the special provisions.

A copy of the permit is available from the regional office by contacting Joseph Coughlin at (608) 261-8975.

If the contractor requires work outside the proposed slope intercepts, based on their method of operation to construct the project, it is the contractor’s responsibility to determine whether a U.S. Army Corps of Engineers Section 404 permit modification is required. If a Section 404 permit modification is necessary, obtain the permit modification prior to beginning construction operations requiring the permit. No time extensions as discussed in standard spec 108.10 will be granted for the time required to apply for and obtain the permit modification. The contractor must be aware that the U.S. Army Corps of Engineers may not grant the permit modification request.

stp-107-054 (20230629)

12. Information to Bidders, WPDES Transportation Construction General Permit (TCGP) for Storm Water Discharges.

The department has obtained permit coverage through the Wisconsin Department of Natural Resources to discharge storm water associated with land disturbing construction activities under this contract. Conform to all permit requirements for the project.

This permit is the Wisconsin Pollutant Discharge Elimination System, Transportation Construction General Permit, (WPDES Permit No. WI-S066796-2). The permit can be found at:

https://widnr.widen.net/s/s5mwp2gd7s/finalsignedwisdotcsgp

A certificate of permit coverage is available from the regional office by contacting Joseph Coughlin at (608) 261-8975. Post the permit certificate in a conspicuous place at the construction site.

stp-107-056 (20230629)

13. Erosion Control.

Add the following to standard spec 107.20:

Perform construction operations in a timely and diligent manner, continuing all construction operations methodically from the initial topsoil stripping operation through the subsequent grading and finishing to minimize the period of exposure to erosion.

Replace topsoil on disturbed areas immediately after grading is completed within those areas. Complete finishing operations, which includes seed, fertilizer, mulch and any other permanent or temporary erosion control measures required, within seven calendar days after the placement of topsoil.

14. Notice to Contractor – Field Office.

Project 1071-07-80 will not include a Field Office bid item as the engineer will oversee both 1071-07-79 and 1071-07-80 projects. Maintain Field Office through the completion of all work for Project 1071-07-80 (anticipated to be September 30, 2025.

15. Electrical / Lighting General.

Work described under this heading refers to exterior lighting only. Interior building lighting is described elsewhere.

Work includes complete installation of the walkway lighting system, including the site lighting control cabinet and service feeds. Also included is all underground infrastructure (conduit, pull boxes, and concrete bases) necessary for overhead lighting within the building project boundaries as indicated on the plans. Above ground infrastructure will be installed, and cabling will be pulled for these overhead lighting components as part of the site project 1071-07-80. Ensure that all conduit is stubbed, capped, and located for connection with site project.

Notify to department’s Electrical Field Unit at (608) 785-9080 at least three weeks prior to the beginning of the Electrical work. The department’s Regional Electrical personnel will perform the inspections.

Electrical item inspections are required at the following times: after the staking of all electrical underground items, islands, curb and gutter, and medians; before the pouring of all lighting and cabinet bases; before cable and wire are pulled; during field terminations at the lighting bases; and prior to the installation of any poles or other above ground electrical items.

Request electrical inspections of the completed lighting work to the engineer and contact the department’s Electrical Field Unit at (608) 785-9080 at least five working days prior to the time of the requested inspection.

16. Base Aggregate Dense 3/4-Inch, Item 305.0110.

Add the following to standard spec 301.2.4.3:

Furnish only aggregate classified as crushed stone for Dense 3/4-Inch when used in the top 3 inches of the unpaved portion of the shoulder or for unpaved driveways and field entrances.

swr-305-001 (20170711)

17. Base Aggregate Dense 1 1/4-Inch for Lower Base Layers.

Replace standard spec 305.2.2.1(2) with the following:

(2) Unless the plans or special provisions specify otherwise, do the following:

1. Use 1 1/4-inch base throughout the full base depth.
2. Use 3/4-inch base in the top 3 inches of the unpaved portion of shoulders. Use 3/4-inch base or 1 1/4-inch base elsewhere in shoulders.

stp-305-020 (20080902)

18. Gates Chain Link 4-FT, Item 616.0329.02.

Add the following to standard spec 616.2.3.9:

Furnish latch chain to be used for locking gate. Latch chains shall meet ASTM A413/A413M, Grade 30. The chain shall be galvanized, 2'-0" in length, and have size requirements consistent with 3/8" regular link. The department will supply the keyed lock.

19. Fence Safety, Item 616.0700.S.

A Description

This special provision describes providing plastic fence at locations the plans show.

B Materials

Furnish notched conventional metal "T" or "U" shaped fence posts.

Furnish fence fabric meeting the following requirements.

Color:	International orange (UV stabilized)
Roll Height:	4 feet
Mesh Opening:	1 inch min to 3 inch max
Resin/Construction:	High density polyethylene mesh
Tensile Yield:	Avg. 2000 lb per 4 ft. width (ASTM D638)
Ultimate Tensile Strength:	Avg. 3000 lb per 4 ft. width (ASTM D638)
Elongation at Break (%):	Greater than 100% (ASTM D638)
Chemical Resistance:	Inert to most chemicals and acids

C Construction

Drive posts into the ground 12 to 18 inches. Space posts at 7 feet.

Use a minimum of three wire ties to secure the fence at each post. Weave tension wire through the top row of strands to provide a top stringer that prevents sagging.

Overlap two rolls at a post and secure with wire ties.

D Measurement

The department will measure Fence Safety by the linear foot along the base of the fence, center-to-center of posts, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
616.0700.S	Fence Safety	LF

Payment is full compensation for furnishing and installing fence and posts; maintaining the fence and posts in satisfactory condition; and for removing and disposing of fence and posts at project completion.

stp-616-030 (20160607)

20. Silt Fence Heavy Duty, Item 628.1530.S; Silt Fence Heavy Duty Maintenance, Item 628.1535.S.

A Description

This special provision describes furnishing, installing, maintaining, repairing, and removing heavy duty silt fence as the plans show, as directed by the engineer, and as hereinafter described.

B Materials

Provide Silt Fence Heavy Duty consisting of a composite of fence posts, fence fabric, geotextile fabric, sand bags or rock bags, and fasteners to be assembled by the contractor.

Furnish new or salvaged notched conventional metal “T” or “U” shaped fence posts with a length of 8 feet and minimum weight of 1.25 lb/ft.

Furnish new fence fabric, or salvaged fence fabric that is free of rust or other structural defects, conforming to standard spec 616.2.2.1 or 616.2.3.2, or one of the following alternatives:

- Woven wire fence - Standard field fence type, minimum 14-½ gauge wire, maximum mesh spacing of 6 inches, and a height of 4 feet.
- Chain link fence – minimum 12-½ gauge, maximum 2.5-inch diamond pattern, and a height of 4 feet.
- Welded wire fence – minimum 14 gauge, maximum mesh spacing of 4 inches, and a height of 4 feet.

Furnish Geotextile Fabric Type HR according to standard spec 645.2.2.7.

Furnish sand bags according to standard spec 628.2.8 or rock bags according to standard spec 628.2.13.

Furnish wire ties, nylon zip ties, or other engineer approved materials.

C Construction

Complete the installation prior to any ground disturbing activities within the drainage area adjacent to the required location. Construct according to the plan details and as described below.

Install posts with a minimum embedment of two feet and as necessary to provide a stable fence system.

Attach fence fabric to posts with at least three ties on each post (top, middle, bottom).

Attach geotextile fabric to fence fabric and/or posts at a maximum spacing of every 2 feet along the top and additionally as necessary to prevent displacement or damage by wind and wave actions. Overlap joints in the geotextile fabric by a minimum of 12 inches. Excess geotextile fabric may be cut or draped over the backside of the fence system.

Secure the bottom of the geotextile fabric by either of the following methods:

- For installation in wet conditions, anchor the lower flap of the geotextile fabric to the ground using a continuous line of sand bags or rock bags. The lower flap shall be a minimum width of 1 foot.
- For installation in dry conditions, bury the bottom edge in a trench that is a minimum of 4 inches wide and 6 inches deep. Fold material to fit trench and backfill and compact trench with excavated soil.

Maintain the fence throughout construction and until removal. Repair or replace fence materials as necessary. Remove sediment whenever it accumulates to approximately one-half the original fence height and as directed by the engineer. Remove all sediment prior to final stabilization.

Keep system in place until the site is permanently vegetated and is ordered for removal by the engineer. Clean up and restore the surface after removal.

D Measurement

The department will measure Silt Fence Heavy Duty by the linear foot, acceptably completed, measured along the base of the fence, center-to-center of end post, for each section of fence.

The department will measure Silt Fence Heavy Duty Maintenance by the linear foot, acceptably completed, measured along the base of the fence, end-to-end of the section maintained, for each time a section of fence is cleaned and repaired.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
628.1530.S	Silt Fence Heavy Duty	LF
628.1535.S	Silt Fence Heavy Duty Maintenance	LF

Payment for Silt Fence Heavy Duty is full compensation for erecting fence, including excavating or trenching, posts, geotextile fabric, sand bags or rock bags, backfilling, removal, restoration, and disposal.

Payment for Silt Fence Heavy Duty Maintenance is full compensation for required cleaning and repairing; for removing and disposing sediment or spreading accumulated sediment to form a surface suitable for seeding; and for replacing fence and damages caused by overloading sediment material or ponding water adjacent to fence.

stp-628-005 (20220628)

21. Landscape Planting Surveillance and Care Cycles.

If the care specialist fails to perform any of the required care cycles as specified in standard spec 632.3.19.1, the department will assess daily damages in the amount of $1,500 to cover the cost of performing the work with other forces. The department will assess these damages for each day the requirements of the care cycle remain incomplete, except when the engineer extends the required time period.

stp-632-005 (20070510)

22. Lighting Control Cabinets 120/240 30-Inch, Item 659.2124.

This article describes modifications to item 659.2124 of the standard specifications and QPL.

Amend standard spec 659.3.5, Lighting Control Cabinet, by adding the following paragraph(s):

(2) Electrical service to the Lighting Control Cabinet shall share a meter with the Rest Area building on the exterior of the west wall. A 120/208V single phase branch circuit shall be provided from the interior building Main Distribution Panel (MDP) control panel in Elect/IT room 115 to the Lighting Control Cabinet. All infrastructure from the building electrical panel to the Lighting Control Cabinet is included in the building electrical plans.

23. Intelligent Transportation Systems (ITS) – Control of Materials.

Standard spec 106.2 – Supply Source and Quality

Add the following to standard spec 106.2:

The department will furnish a portion of equipment to be installed by the contractor. This department-furnished equipment includes the following:

Department-Furnished Items
CCTV Cameras
CCTV Camera Poles
Ethernet Switches
Pole-Mounted Cabinets

Pick-up small department-furnished equipment, such as communications devices, cameras, and controllers, from the department's Statewide Traffic Operations Center (STOC), 433 W. St. Paul Ave., Milwaukee, WI 53203 at a mutually agreed upon time during normal state office hours. Contact the department's STOC at (414) 227-2166 to coordinate pick-up of equipment.

Large department-furnished equipment, such as poles will be delivered by the supplier to a contractor-controlled site within Monroe County. Delivery will not necessarily be in a "just in time" manner. Store the equipment until field installation. Provide location details and a contact for delivery coordination upon receiving the contract's Notice to Proceed.

Transportation of the equipment between the electric shop and the field or interim location(s) shall be the responsibility of the contractor.

Standard spec 106.3 – Approval of Materials

Add the following to standard spec 106.3:

Design/Shop Drawings

Prior to the purchase and/or fabrication of any of the components listed herein, and for any non-catalog item shown on the Material and Equipment List specified above, and no more than 30 days after notice to proceed, submit five copies of design drawings and shop drawings, as required, to the department for review. The items and the drawings that represent them shall meet the requirements of the standard specifications.

Design drawing submissions shall consist of signed and certified designs, design drawings, calculations, and material specifications for required items.

Shop drawings will be required for, but not limited to the following:

1. **Mounting assemblies for the vehicle speed and classification sensors, including their attachment to the structure.**
2. **Mounting LED warning signs to the sign structure.**
3. **Mounting detail for dynamic message signs.**
4. **Any contractor-designed structure or foundation.**

The department will complete its review of the material within 30 days from the date of receipt of the submission, unless otherwise specified. The department will advise the contractor, in writing, as to the acceptability of the material submitted. The department may determine that if no exceptions were taken for the item, it is approved, and no further action is required by the contractor; or the item may be partially or totally rejected, in which case modify and/or amend the submittal as required by the department and resubmit the item within 14 days. At this time, the review and approval cycle described above will begin again.

670-005 (20150630)

24. Intelligent Transportation Systems – General Requirements.

A Description

A.1 General

This contract includes furnishing and installing elements for an Intelligent Transportation System (ITS) in or along the existing roadway as shown on the plans.

Unusual aspects of this project include:

1. **The project includes working on cables and equipment that are carrying data between roadside equipment and the department's Statewide Traffic Operations Center (STOC). Interruption of this service is not expected to perform this work. If an interruption is determined necessary, it must be done on a weekend, and must be done in a way that minimizes communication outages for the existing equipment. Notify the department's STOC at least 48 hours in advance of the planned interruption.**

2. **The department will furnish some of the equipment to be installed. Make a reasonable effort to discover defects in that equipment prior to installing it.**

A.2 Surge Protection

Equip every ungrounded conductor wire entering or leaving any equipment cabinet with a surge protector. For purposes of this section, multiple cabinets on a single pole or foundation are considered a single cabinet.

B Materials

B.1 General

Only furnish equipment and component parts for this work that are new and have high quality workmanship. All controls, indicators, and connectors shall be clearly and permanently labeled in a manner approved by the engineer. All equipment of each type shall be identical.

All electrical equipment shall conform to the standards and requirements of the Wisconsin Electrical Code, the National Electrical Manufacturers Association (NEMA), National Electric Safety Council (NESC), Underwriter's Laboratory Inc. (UL) or the Electronic Industries Association (EIA), when applicable. All materials and workmanship shall conform to the requirements of the National Electrical Code (NEC), Rural Electrification Administration (REA), Standards of the American Society for Testing and Materials (ASTM), American Association of State Highway and Transportation Officials (AASHTO), requirements of the plans these special provisions, the standard specifications, and to any other codes, standards, or ordinances that may apply. All system wiring, conduit, grounding hardware and circuit breakers shall be in conformance with the National Electrical Code. Whenever reference is made to any of the standards mentioned, the reference shall be considered to mean the code, ordinance, or standard that is in effect at the time of the bid advertisement.

B.2 Outdoor Equipment

All conductive connectors, pins (except pins connected by soldering), and socket contacts shall be gold plated. Acrylic conformal coating shall protect each circuit board side that has conductive traces. Except for integrated circuits containing custom firmware, all components shall be soldered to the printed circuit board.

To prevent galvanic corrosion, all connections between dissimilar metals shall incorporate a means of keeping moisture out of the connection. Where the connection need not conduct electricity, interpose a non-absorbing, inert material or washer between the dissimilar metals. Use nonconductive liners and washers to insulate fasteners from dissimilar metals. Where the connection must conduct electricity, use a conductive sealant between the dissimilar metals. Alternatively, use an insulating gasket and a bond wire connecting the two metal parts.

B.3 Custom Equipment

Equipment that is not part of the manufacturer's standard product line, or that is made or modified specifically for this project, shall conform to the following requirements:

Where practical, electronics shall be modular plug-in assemblies to facilitate maintenance. Such assemblies shall be keyed to prevent incorrect insertion of modules into sockets.

All components shall be available from multiple manufacturers as part of the manufacturers' standard product lines. All must be clearly labeled with the value, part number, tolerance, or other information sufficient to enable a technician to order an exact replacement part.

Lamps used for indicator purposes shall be light-emitting diodes.

The printed circuit boards shall be composed of "two-ounce" copper on 1/16-inch thick fiberglass epoxy or equivalent type construction. Holes that carry electrical connections from one side of the boards to the other shall be completely plated through. Multilayer printed circuit boards shall not be used. The name or reference number used for the board in the drawings and maintenance manuals supplied to the department shall be permanently affixed to each board.

All components shall be mounted so that the identifying markings are visible without moving or removing any part, if practical.

B.4 Environmental Conditions

Equipment shall continue to operate as specified under the following ranges of environmental conditions, except as noted in the specifications for individual pieces of equipment.

Vibration and Shock: Vehicle speed and classification sensors and any other equipment mounted atop poles or on structures shall not be impaired by the continuous vibration caused by winds (up to 90 mph with a 30 percent gust factor) and traffic.
Duty Cycle: Continuous
Electromagnetic Radiation: The equipment shall not be impaired by ambient electrical or magnetic fields, such as those caused by power lines, transformers, and motors. The equipment shall not radiate signals that adversely affect other equipment.
Electrical Power:

a. Operating power: The equipment shall operate on 120-volts, 60-Hz, single-phase unless otherwise specified. It shall conform to its specified performance requirements when the input voltage varies from 89 to 135 volts and the frequency varies +3 Hz.
b. High frequency interference: The equipment operation shall be unaffected by power supply voltage spikes of up to 150 volts in amplitude and 10 microseconds duration.
c. Line voltage transients: The equipment operation shall be unaffected by voltage transients of plus or minus 20 percent of nominal line voltage for a maximum duration of 50 milliseconds. Equipment in the field shall meet the power service transient requirements of NEMA Standard TS-2 when connected to the surge protectors in the cabinets.

Temperature and Humidity:

a. **Field equipment: Equipment in the field shall meet the temperature and humidity requirements of NEMA Standard TS-2. Liquid crystal displays shall be undamaged by temperatures as high as 165 degrees F, and shall produce a usable display at temperatures up to 120 degrees F.**
b. **Equipment in Controlled Environments shall operate normally at any combination of temperatures between 50 degrees F and 100 degrees F, and humidity's between 5 percent and 90 percent, non-condensing, and with a temperature gradient of 9 degrees F per hour.**

B.5 Patch Cables and Wiring

All cables and wiring between devices installed in a single cabinet, or in separate cabinets sharing a single concrete base, will be considered incidental to the installation of the devices and no separate payment will be made for them. It is anticipated that this will include fiber optic patch cables between termination panels and Ethernet switches, 10 / 100 MBPS Ethernet cables, RS-232 cables between individual devices and terminal servers, and power cables between individual devices and power sources within the cabinets.

B.6 Surge Protection

Low-voltage signal pairs, including twisted pair communication cable(s) entering each cabinet shall be protected by two-stage, plug-in surge protectors and shall be installed on both ends of camera control cables. The protectors shall meet or exceed the following minimum requirements:

1. **The protectors shall suppress a peak surge current of up to 10k amps.**
2. **The protectors shall have a response time less than one nanosecond.**
3. **The protector shall clamp the voltage between the two wires at a voltage that is no more than twice the peak signal voltage, and clamp the voltage between each wire and ground at 50 volts.**
4. **The first stage of protection shall be a three-element gas discharge tube, and the second stage shall consist of silicon clamping devices.**
5. **The protector shall also contain a resettable fuse (PTC) to protect against excessive current.**
6. **There shall be no more than two pairs per protector.**
7. **It shall be possible to replace the protector without using tools.**

Cables carrying power to curve signs shall be protected at the cabinet by grounded metal oxide varistors of appropriate voltages. The varistors must be at least 0.8 inch in diameter.

C Construction

C.1 Thread Protection

Provide rust, corrosion, and anti-seize protection at all thread assemblies of metallic parts by coating (non-spray) the mating surfaces with an approved compound. Failure to use an approved compound will result in no payment for the items to which coating was to have been applied.

C.2 Cable Installation

When installing new cables into conduits containing existing cables, remove the existing cables and reinstall the existing cables simultaneously with the new cables. Take every precaution necessary to protect the existing cables. In the event of avoidable damage to the existing cables, replace all damaged cables, in-kind, at no additional expense to the department. When cables are pulled into conduit, use a cable pulling lubricant approved by the cable manufacturer. Submit documentation supporting manufacturer approval of the lubricant to the engineer.

C.3 Wiring

Every conductor, except a conductor contained entirely within a single piece of equipment, must terminate either in a connector or on a terminal block. Provide and install the connectors and terminal blocks where needed, without separate payment. Use approved splice kits instead of connectors and terminal blocks for underground power cable splices.

Permanently label and key connectors to preclude improper connection. Obtain prior engineer approval for the labeling method(s) prior to use.

Terminal blocks must be affixed to panels that permanently identify the block and what wire connects to each terminal. This may be accomplished by silk screening or by installing a laminated printed card under the terminal block, with the labels on portions of the card that extend beyond the block. Installation of terminal blocks by drilling holes in the exterior wall of the cabinet is not acceptable.

Use barriers to protect personnel from accidental contact with all dangerous voltages.

Do not install conductors carrying AC power in the same wiring harness as conductors carrying control or communication signals.

Arrange wiring, including fiber optic pigtails, so that any removable assembly can be removed without disturbing wiring that is not associated with the assembly being removed.

Communication and control cables may not be spliced underground, except where indicated on the plans.

Cables in the Statewide Traffic Operations Center or in communication hubs, which are not contained within a single cabinet, shall have at least 10 feet of slack.

C.4 System Operations

If the contractor’s operations unexpectedly interrupt Intelligent Transportation Systems (ITS) service, notify the engineer immediately and restore service within 24 hours. Repair all damaged facilities to the condition existing before the interruption. If service is not restored within 24 hours, the department may restore service to any operating device and deduct restoration costs from payments due the contractor.

C.5 Surge Protection

Arrange the equipment and cabinet wiring to minimize the distance between each conductor’s point of entry and its protector. Locate the protector as far as possible from electronic equipment. Ensure that all wiring between the surge protectors and the point of entry is free from sharp bends.

D Measurement

No separate measurement will be made for the work described in this article.

E Payment

No separate payment will be made for the work described in this article. All work described in this article shall be included under the ITS items in the contract.

670-010 (20100709)

25. Install Pole Mounted Cabinet, Item 673.1225.S.

A Description

This special provision describes installing department furnished aluminum enclosures on poles for intelligent transportation systems equipment.

B Materials

Use stainless steel bolts, nuts, and washers unless otherwise specified.

All conductors, terminals, and parts that could be hazardous to maintenance personnel shall be protected with suitable insulating material.

The cabinet will be equipped with service panels. Two panels shall be provided and mounted on the cabinet sidewalls. The left side panel shall be designated as "Input/Communications," and the right side panel shall be designated as the "Service Panel."

The service panel will be equipped with a four-outlet handi-box. Wire the handi-box to the series portion of the filtering surge protector.

Use metallic conduit, fittings, and adapters required from the underground conduit transition point to the cabinet as part of this item. A typical installation requires on 2-inch conduit. Use metallic conduit conforming to standard spec 652.

C Construction

Coordinate receiving the cabinet from the department’s vendor and protect and store the cabinet between receiving the cabinet and installing as shown on the plans. Note and photograph any damage to the cabinet upon receipt and notify the engineer and the Statewide ITS Engineer of any damage.

Fasten the field cabinet securely onto a pole. Provide bolted stainless steel connections with lock washers, locking nuts, or other engineer-approved means to prevent the connection nuts from backing off. Isolate dissimilar materials from one another using stainless steel fittings. Make all power connections to the cabinet as specified in standard spec 656.

Drill and tap the cabinet, as necessary, to mount the terminal blocks and other attachments to the service panel, to provide an entrance on the back of the cabinet for cable from the pole mounted intelligent transportation systems equipment, and to mount the service panel to the cabinet as shown in the details. Remove all sharp edges or burrs, or both, caused by the cutting or drilling process. Seal all openings to prevent water from entering the cabinet. Mount the surge protector to the service panel.

Install metallic conduit on the exterior of the pole (for entrance to the cabinet from the ground) as the plans show, and according to the applicable requirements of standard spec 652.

D Measurement

The department will measure Install Pole Mounted Cabinet as each individual assembly, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
673.1225.S	Install Pole Mounted Cabinet	EACH

Payment is full compensation for storing the pole mounted cabinet, installing the pole mounted cabinet; for making all connections and conduit/wire entrances; and for all testing.

stp-673-010 (20230629)

26. Unit Paving.

These general requirements are applicable to the Unit Paving bid item. All work related to these requirements will be paid for under the Unit Paving bid item.

Section 32 14 13 - Concrete Unit Paving

PART 1 GENERAL

1.1 SUMMARY

A. Section includes the following:

1. **Concrete Unit Pavers.**
2. **Polymeric Joint Sand.**
3. **Setting Bed Aggregate.**
4. **Base Aggregate.**

1.2 REFERENCES

A. WisDOT Standard Specification Section 305 - Dense-Graded Base; WisDOT.

B. ASTM C33/C33M, Standard Specification for Concrete Aggregates.

C. ASTM C136/C136M, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM C140/C140M, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.

E. ASTM C936/C936M, Standard Specification for Solid Concrete Interlocking Paving Units.

F. ASTM C979/C979M, Standard Specification for Pigments for Integrally Colored Concrete.

G. ASTM C1262/C1262M, Standard Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units.

1.3 SUBMITTALS

A. Concrete Pavers:

1. **Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.**
2. **Accepted samples become the standard of acceptance for the product produced.**
3. **Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C936/C936M.**
4. **Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.**

B. Setting Bed Aggregate:

1. **Provide three representative one pound samples in containers of Setting Bed Aggregate material.**
2. **Test results from an independent testing laboratory for sieve analysis per ASTM C136/C136M conforming to the grading requirements of ASTM C144.**

C. Polymeric Joint Sand:

1. **Test results from an independent testing laboratory for sieve analysis per ASTM C136/C136M conforming to the grading requirements of ASTM C144.**
2. **Samples for Initial Selection: Provide three representative samples in containers of Joint Sand material, cured and dried, for color selection.**
3. **Samples for Verification: Provide three one pound samples in containers of Joint Sand.**

D. Base Aggregate:

1. **Contractor shall coordinate and pay for independent testing agency to perform Source Quality Control testing per the following:**
   a. **Obtain samples for testing from material in stock at locations and by methods approved by the Engineer.**
   b. **Provide 1 gradation test of each class of aggregate base.**
   c. **Provide 1 fracture test of each class of aggregate base.**
   d. **Provide 1 liquid limit and plasticity test of each class of aggregate base.**
   e. **Perform tests no more than 90 calendar days before Notice of Award.**

f. Submit test results to the Engineer prior to delivering materials to Site.

E. Paving Installation Contractor:

1. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.4 QUALITY ASSURANCE

A. Utilize a Manufacturer having at least ten years of experience manufacturing concrete pavers on projects of similar nature or project size.

B. Source Limitations:

1. Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
2. Obtain Joint Sand from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.

C. Paving Contractor Qualifications:

1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.

1.5 DELIVERY, STORAGE & HANDLING

A. In accordance with Conditions of the Contract and Division 01 Product Requirement Section.

B. Deliver Concrete Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.

1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
2. Deliver Concrete Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
3. Unload Concrete Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.

C. Store and protect materials free from mud, dirt and other foreign materials.

D. Prevent Joint Sand from exposure to rainfall or removal by wind with secure, waterproof covering.

E. Store Joint Sand on elevated platforms, under a cover and/or in a dry location.

1.6 PROJECT / SITE CONDITIONS

A. Environmental Requirements:

1. Install Concrete Pavers only on unfrozen and dry Setting Bed.
2. Install Setting Bed only on unfrozen and dry Base or Subbase Aggregate materials.
3. Install Base or Subbase Aggregates only over unfrozen subgrade.
4. Install Setting Bed or Concrete Pavers when no heavy rain or snowfall are forecast within 24 hours.

B. Weather Limitations for Jointing Sand:

1. Install Joint Sand only when ambient temperature is above 40°F (5°C), under dry conditions with no rain forecast for 24 hours and when surface of pavement is completely dry.

1.7 CONCRETE PAVER OVERAGE AND ATTIC STOCK

A. Provide a minimum of 5% additional material for overage to be used during construction.

B. Contractor to provide 100 square feet of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.

C. Manufacture to supply maintenance and reinstatement manuals for Concrete Paver units.

1.8 LEED REQUIREMENTS

A. Add any specific requirements necessary for achieving desired credits.

PART 2 PRODUCTS

2.1 CONCRETE PAVERS

A. Basis-of-Design Product:

1. Wausau Tile H-Series.

a. Address: PO Box 1520, Wausau, WI 54402-1520

b. Contact: Tom Mroczenski; tmroczenski@wausautile.com c. Phone: 800.388.8728

2. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.

B. Product requirements:

1. Concrete Paver: Wausau Tile H-Series.

a. Finish: Estate.

b. Color: HRT-32

c. Edge: 1/8 inch bevel.

d. Spacer Lugs: 3/16 inch.

e. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 inch for length and width. Maximum height tolerance of plus or minus 1/8 inch.

(1) Dimensions: 15 inches by 30 inches by 2 inch thickness.

(2) Note: Imperial dimensions are nominal equivalents to the metric dimensions.

C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C936/C936M, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.

1. Average compressive strength 9500 psi with no individual unit less than 8,000 psi.

2. Water absorption less than 4.5% when tested according to ASTM C140/C140M.

3. Average flexural strength greater than 1,800 pounds.

4. Freeze/thaw less than 1% loss of dry weight (100 cycles) ASTM C1262/C1262M.

5. Center load of 2000 pounds when tested according to WTCL 99.

D. Accept only pigments in concrete pavers conforming to ASTM C979/C979M. Note: ACI Report No. 212.3R provides guidance on the use of pigments.

E. Maximum allowable breakage of product is 5%.

2.2 POLYMERIC JOINT SAND

A. Provide Polymeric Joint Sand as manufactured by:

1. Techniseal HP NextGel - High Performance Polymeric Sand, or Approved Equal.

a. Color: Urban Grey.

B. Provide Joint Sand meeting the minimum material and physical properties as follows:

1. Compression Strength: proven resistance to compression of 550 PSI after drying for 7 days under controlled conditions (73°F (23°C) at 50% humidity).

a. Test sand sample shape: cylinder (2” (5 cm) dia. X 4” (10 cm) high).

2.3 SETTING BED AGGREGATE

A. Provide Setting Bed Aggregate materials conforming to ASTM C33/C33M and gradation requirements of ASTM D448 No. 8 as presented in Table 3.

1. TABLE 3 – SETTING BED AGGREGATE GRADATION REQUIREMENTS

	ASTM No. 8
Sieve Size	**Percent Passing**
½ in (12.5 mm)	100
3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

2.4 BASE AGGREGATE

A. WisDOT Specification Section 305 - Dense Graded Base.

1. WisDOT Base Aggregate Dense 1 1/4-Inch.

2.5 EDGE RESTRAINTS

A. Commercial Aluminum Paver Restraint Edging as manufactured by:
   1. Sure-loc Aluminum Edging Corporation, BLOCK L-EDGE, or Approved Equal.
   a. Length: 8’ (2.4 m)
   b. Height: 2.5” (63 mm)
   c. Thickness: 1/8” (3.2 mm)
   d. Flange: 2” (51 mm)
   e. Finish: Natural Aluminum

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance for the following items before placing the Concrete Pavers.
   1. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
   2. Verify that Geotextiles, if applicable, have been placed according to drawings and specifications.
   3. Verify that the Base Aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.
   4. Provide written density test results for soil subgrade, Base Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
   5. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Beginning of Bedding Sand and Concrete Paver installation signifies acceptance of Base and edge restraints.

3.2 PREPARATION

A. Verify that the subgrade soil is free from standing water.

B. Stockpile Setting Bed, Joint Sand, Base and Subbase Aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the Geotextile and Subbase Aggregate materials.

D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Geotextile, Joint Sand, Setting Bed, Base and Subbase Aggregate materials contaminated with sediment with clean materials.

E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Base or Subbase Aggregate construction.

F. drainage appurtenances during installation. Report all damage immediately.

G. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D1557 for vehicular areas. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.

H. Backfill all service trenches within the pavement area to the sub- grade level with approved material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D698.

I. Trim the subgrade to within 0 to ½ in. (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.

J. Proof-roll prepared subgrade according to requirements in Division 31 Section "Earth Moving" to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting and replace with

compacted backfill or fill as directed.

K. Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected by the Architect/Engineer.

L. Base compaction of the subgrade soil on the recommendations of the Design Engineer. Request the Architect/Engineer to inspect subgrade preparations, elevations and conduct density tests for conformance to specifications.

3.3 INSTALLATION

A. Edge Restraints

1. Provide edge restraints as indicated.

a. Provide plastic or metal edge restraints along the perimeter of all paving as indicated and supported on a minimum of 6 inches (150 mm) of Base Aggregate.

b. Provide 10" spiral galvanized or stainless-steel spike to fasten plastic edge restraint at 24 inches on center for straight sections and 12 inches on center for curved sections.

B. Base Aggregate

1. Provide the Subbase Aggregate in uniform lifts not exceeding 6 in., (150 mm) loose thickness and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.

2. Compact the Subbase Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.

3. Tolerance: Do not exceed the specified surface grade of the compacted Subbase Aggregate material more than ±3/4 in. (20 mm) over a 10 ft. (3 m) long straightedge laid in any direction.

4. Provide the Base Aggregate material in uniform lifts not exceeding 6 in. (150 mm) over the compacted Subbase Aggregate (or Subgrade) material and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.

5. Compact the Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.

6. Tolerance: Do not exceed the specified surface grade of the compacted Base Aggregate material more than ±3/8 in. (10 mm) over a 10 ft. (3 m) long straightedge laid in any direction.

7. Compact and grade the upper surface of the base sufficiently to prevent infiltration of the bedding sand into the base both during construction and throughout its service life. Blend segregated areas of the granular base by the application of crushed fines that have been watered and compacted into the surface.

C. Setting Bed Aggregate

1. Provide, spread and screed Setting Bed Aggregate evenly over the compacted Base Aggregate course.

a. Protect screeded Setting Bed Aggregate from being disturbed by either pedestrian or vehicular traffic.

b. Screed only the area which can be covered by pavers in one day.

c. Do not use Setting Bed Aggregate material to fill depressions in the base surface.

2. Keep moisture content constant and density loose and constant until ConcretePavers are set and compacted.

3. Screed Setting Bed Aggregate using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards. Maintain in a loose condition slightly ahead of the paving units and fully protect against incidental compaction following screeding. Loosen compacted aggregate by rain or screeded aggregate left overnight before further paving units are placed.

4. Inspect the Setting Bed Aggregate course prior to commencing the placement of the Concrete Pavers. Acceptance of the Setting Bed Aggregate occurs with the initiation of Concrete Paver placement.

D. Concrete Pavers

1. Replace Concrete Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).
3. Exercise care in handling face mix concrete pavers to prevent surfaces from contacting backs or edges of other units.
4. Provide Concrete Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.
5. Use string lines or chalk lines on Setting Bed to hold all pattern lines true.
6. Set paver surface elevation a minimum of 3 mm (1/8 inch) to a maximum of 6 mm (1/4 inch) above adjacent drainage inlets, concrete collars or channels (provided the change in slope does not impede or alter the drainage or direction of flow).
7. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
    a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
8. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
9. Prevent joint (bond) lines from shifting more than ±1/2 in. (±13 mm) over 50 ft. (15 m) from string lines.
10. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
11. Cut Concrete Pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
12. Prevent all traffic on installed Concrete Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Concrete Pavers that have not received initial compaction and Joint Sand material.
13. Vibrate Concrete Pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:
    a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
    b. Compact installed Concrete Pavers to within 6 feet (2 meters) of the laying face before ending each day's work. Cover Concrete Pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Setting Bed from becoming disturbed.
14. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
15. Remove any cracked or structurally damaged Concrete Pavers and replace with new units prior to installing Joint Sand material.

E. Joint Sand

1. Provide, spread and sweep dry Joint Sand into joints immediately after vibrating pavers into Setting Bed course until full. Vibrate pavers and add Joint Sand material until joints are completely filled, then remove excess material. This will require at least 4 passes with a plate compactor.
2. Leave all work to within 3 ft. (1 m) of the laying face fully compacted with sand- filled joints at the completion of each day.
3. Remove excess Joint Sand broom clean from surface when installation is complete.
4. Polymeric Joint Sand
    a. Install Polymeric Joint Sand per manufacturers recommended instructions.

3.4 FIELD QUALITY CONTROL

A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
    1. Prevent final Concrete Paver finished grade elevations from deviating more than
        a. ±3/8 in. (±10 mm) under a 10 foot (3 m) straightedge or indicated slope, for finished surface of paving.

B. Lippage: Paver-to-Paver Lippage:
    1. No greater than 3 mm (1/8 inch) difference in height between adjacent pavers.

3.5 REPAIRING, CLEANING AND SEALING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
    1. Clean Concrete Pavers according to the manufacturer's written recommendations.

3.6 PROTECTION

A. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION

27. Chain Link Fences and Gates.

These general requirements are applicable to the Fence Chain Link and Gates Chain Link bid items. All work related to these requirements will be paid for under the respective Fence Chain Link and Gates Chain Link bid items.

Section 32 31 13 - Chain Link Fences and Gates

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Posts, rails, and frames.
B. Wire fabric.
C. Barbed wire.
D. Manual gates with related hardware.
E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.3 REFERENCE STANDARDS

A. WisDOT Standard Specifications Section - 616 Property and Right-of-Way Fence.
B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
D. CLFMI CLF-SFR0111 - Security Fencing Recommendations 2014.

E. Unless otherwise noted, the provisions in this Section are in addition to the referenced specification.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Chain Link Fences and Gates:

1. Current members of the CLFMI.

2. Century Fence Company: www.centuryfence.com.

3. Wallace International: www.wallaceintl.com.

4. Ameristar Fence: www.ameristarfence.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. Line Posts: 1.9 inch diameter.

B. Corner and Terminal Posts: 2.38 inch diameter.

C. Fabric: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

D. Fabric with Pre-Inserted Slats: 1 1/2 inch diamond mesh interwoven wire, 6 gage, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

1. Privacy Slats: High-density polyethylene (HDPE), woven into fabric.

a. Visual Barrier: 95 percent.

b. Slat Color: Black.

E. Tension Wire: 6 gauge, 0.1920 inch thick steel, single strand.

F. Tie Wire: Aluminum alloy steel wire.

2.3 MATERIALS AND COMPONENTS

A. Materials and Components: conform to WisDOT Specifications.

B. Fabric Size: CLFMI Standard Industrial, Heavy Residential service.

2.4 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

B. Hinges: Finished to match fence components.

2.5 FENCE GENERAL

A. Mesh or Fabric hole size: 1 1/2 inch maximum.

B. Height of Fence: 7 feet tall.

C. Openings: Fence shall not have any opening greater than four inches; nor have any opening greater than two inches below the fence.

2.6 ACCESSORIES

A. Chain Link Fence Gate Exit Device: D-6030-S Surface Mount Exit Bar - Standard Kit without Lock Box. mounting plate to accommodate size of Exit Signage.

1. Include rim cylinder; exterior side shall be blank.

2. Gate hardware shall be self closing and latching.

B. Exit Signage: Item # A5243 by www.safetysign.com. Product to be UV resistant; fasten to metal panel with corrosion resistant rivets.

2.7 FINISHES

A. Components (Other than Fabric): Galvanized according to ASTM A123/A123M, at 1.7 ounces per square foot.

B. Components and Fabric: Vinyl coated over coating of 1.8 ounces per square foot galvanizing.

C. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

D. Accessories: Same finish as framing.

E. Vinyl Coated Fabric Color: Black.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fence fabric, posts, gates, and other accessories according to WisDOT Standard Detail Drawing 15B3-a Chain Link Fence.

B. Place fabric on outside of posts and rails.

C. After installation of fabric and wire cut off excess wire and bend over to prevent injury.

3.2 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Do not infringe on adjacent property lines.

3.3 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

END OF SECTION

28. Site Furnishings.

These general requirements are applicable to the site furnishing bid items listed below in section 1.1. All work related to these requirements will be paid for under the respective site furnishing bid items.

Section 32 33 00 - Site Furnishings

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site Furnishings:

1. Picnic Table.
2. ADA Picnic Table.
3. Bench.
4. Picnic Shelter.
5. Litter Receptacle.
6. Recycling Receptacle.
7. Split Rail Fence.
8. Flag Pole.
9. Planting Container.

1.2 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2200 - Unit Prices, for additional unit price requirements.

B. Provide work under unit price method per Proposal and the following:

C. Furnishing and installing of specific items and/or performance of Work under certain circumstances shall not be individually paid. Costs shall be included in unit price bid for associated aggregate items. Such items of work include but are not limited to:

1.3 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

E. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2019.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

C. Shop Drawings: Indicate plans for each unit or group of units, elevations with model number, overall dimensions, construction, and anchorage details for each mounting condition.

D. Product Warranty: Provide manufacturer warranty information for each product.

E. Samples: Submit two sets of selected manufacturer's colors.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Kay Park; https://kaypark.com/ 1. Phone: 866.407.5971

2. Email: sales@kaypark.com

B. Wausau Tile; https://wausautile.com/

1. Sales Contact: Tom Mroczenski, Phone: (715) 241-0376, Email: TMroczenski@wausautile.com

C. Cedar Forest Products; https://cedarforestproducts.com/

1. Sales Contact: Larry Rife, ABCreative, Phone: (515) 333-9800, Email: larry@abcreative.net

D. Eder Flag; https://ederflag.com/pages/flagpoles

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 SITE FURNISHINGS

A. Site Furnishings, General:

1. Steel components: Plates, bars, and shapes complying with ASTM A36/A36M and tubing complying with ASTM A500/A500M; cleaned, treated, and powder- coated.

2. Aluminum Components: ASTM B211/B211M.

3. Mounting: Surface mount per manufacturer's recommendations with 304 grade stainless steel, tamper resistant hardware unless otherwise noted.

B. Picnic Table.

1. Manufacturer: Kay Park.

2. Model: Single Post Square Table, Model No. 4SPTGVP

3. Materials:

a. Frame: Powder Coat (Black).

b. Table Top and Seats: Expanded Metal, Vinyl Plastisol (Brown).

4. Mounting: In-Ground Mount.

C. ADA Picnic Table.

1. Manufacturer: Kay Park.

2. Model: Single Post Square Table, Model No. 4SPTGVP-3S

a. 3-Seat Version for ADA accessibility.

3. Materials:

a. Frame: Powder Coat (Black).

b. Table Top and Seats: Expanded Metal, Vinyl Plastisol (Brown).

4. Mounting: In-Ground Mount.

D. Bench.

1. Manufacturer: Kay Park.

2. Model: 6’ Stationary Bench with Back, Model No. 62SGVP

3. Materials:

a. Frame: Powder Coat (Black).

b. Bench Seat and Back: Expanded Metal, Vinyl Plastisol (Brown).

4. Mounting: In-Ground Mount.

E. Picnic Shelter.

1. Manufacturer: Cedar Forest Products.

2. Model: Rectangular Wood Hip Shelter, 14 feet x 24 feet.

3. Materials:

a. Roofing: 24 Gauge Metal Roofing with Cedar Roof Decking.

b. Columns: Cedar Posts with Metal Base Shoes.

4. Mounting: Frost Depth Footings per Manufacturer Recommendations.

F. Litter Receptacle.

1. Manufacturer: Wausau Tile
2. Model: Concrete Trash Receptacle with Domed Plastic Top, Model No. TF1150
3. Materials:
    a. Concrete: Acid Wash, A31 Fog
    b. Plastic: 10 Charcoal
4. Mounting: Surface Mount per Manufacturer Recommendations.

G. Recycling Receptacle.
1. Manufacturer: Wausau Tile
2. Model: Concrete Trash Receptacle with Domed Plastic Top, Model No. TF1150
3. Materials:
    a. Concrete: Acid Wash, A26 Charcoal
    b. Plastic: 0 Blue
4. Mounting: Surface Mount per Manufacturer Recommendations.

H. Split Rail Fence.
1. Material: 100% Western Red Cedar (Thuja plicata).
    a. Fencing material shall be free of additives, stains, paints or other chemicals. Material shall be sourced legally.
2. Rail Specifications:
    a. Rails shall be approximately 2" x 4 1/2" with a minimum girth of 12". Tenon area shall be 2 1/2" - 3" in length by 1 1/2" in thickness and 4" or less in width. The lower rail should be approximately 12" from the bottom of the rail to the existing ground.
    b. Rails are 96" in length.
3. 2-Rail Fence Specifications:
    a. Posts shall measure approximately 4 1/2" x 5" x 84" in length. Minimum girth should measure 18" between the mortise openings.
    b. The distance from the top of the post to the first mortise opening shall be 6" and the distance, center to center, between the mortise openings shall be 14". The mortise opening shall be 1 3/4" wide and approximately 4 1/2" in length.
    c. Posts are buried approximately 48" into the ground.

I. Flagpole.
1. Exposed Height: 30'
2. Butt Diameter: 6"
3. Top Diameter: 3-1/2"
4. Flag Size: 5' x 8'
5. Finish: Standard Anodized Aluminum, Satin.
6. Style: Model ECV30 - Eder Flag Vanguard Internal Halyard.
    a. Ground Set Tapered Aluminum Flagpole.
    b. Revolving Internal Halyard Truck.
    c. Stainless Steel Swivel Snaps.
    d. 6" Diameter Aluminum Ball Ornament, Satin.
7. Mounting: Embedded in Frost Footing Per Manufacturer's Recommendations.

J. Planting Container.
1. Manufacturer: Wausau Tile.
2. Model: Eclipse Concrete Planter, Model No. TF4003.
3. Dimensions: 36" Diameter, 23" Height.
4. Color: Acid Wash, A38 Night.
5. Drainage: 2" Diameter Drain Hole.
6. Install per plans and manufacturer recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive site furnishing items.

B. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Examine conditions with installer for compliance with finished grade, mounting surfaces, and installation tolerances.

B. Install site furnishings according to approved shop drawings, and manufacturer's installation instructions.

C. Remove and replace damaged components that cannot be successfully repaired.

D. Provide level mounting surfaces for site furnishing items. Install furnishings level, plumb and true.

END OF SECTION

29. Bench, Item SPV.0060.01.

A Description

This item consists of Bench. The work shall be according to the applicable plans and the 33 32 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Bench by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.01	Bench	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

30. Litter Receptacle, Item SPV.0060.02.

A Description

This item consists of Litter Receptacle. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Litter Receptacle by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.02	Litter Receptacle	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

31. Recycling Receptacle, Item SPV.0060.03.

A Description

This item consists of Recycling Receptacle. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Recycling Receptacle by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.03	Recycling Receptacle	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

32. Picnic Table, Item SPV.0060.04.

A Description

This item consists of Picnic Table. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Picnic Table by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.04	Picnic Table	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

33. ADA Picnic Table, Item SPV.0060.05.

A Description

This item consists of ADA Picnic Table. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure ADA Picnic Table by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.05	ADA Picnic Table	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

34. Flag Pole, Item SPV.0060.06.

A Description

This item consists of Flag Pole. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Flag Pole by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.06	Flag Pole	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

35. Planting Container, Item SPV.0060.07.

A Description

This item consists of Planting Container. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications. Provide neoprene shims for leveling as noted in the plans, to be assembled by the contractor.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Planting Container by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.07	Planting Container	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

36. Picnic Shelter, Item SPV.0060.08.

A Description

This item consists of the Picnic Shelter. The work shall be according to the applicable plans and the 32 33 00 Site Furnishings specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Picnic Shelter by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.08	Picnic Shelter	EACH

Payment is full compensation for furnishing and installing all materials and equipment.

37. Install Cellular Modem, Item SPV.0060.09.

A Description

This special provision describes installing a wireless cellular modem and antenna and providing all necessary associated wiring.

B Materials

The department will furnish the wireless cellular modem and antenna. Provide all necessary cables between the wireless modem and device to be connected to it.

C Construction

Drill a hole in the new or existing cabinet to install the wireless modem antenna cable through. Mount the antenna on top of the cabinet and seal the hole with purpose-made waterproof sealing device such as a grommet or gasket.

Install the wireless modem in a new or existing field cabinet. Connect it to the antenna and to devices as shown on the plans, or as directed by the engineer.

D Measurement

The department will measure Install Cellular Modem by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.09	Install Cellular Modem	EACH

Payment is full compensation for installing a cellular modem; furnishing all necessary incidental hardware; and making all necessary connections.

38. Ground Rod, Item SPV.0060.10.

A Description

This special provision describes installing a ground rod and ground wire.

B Materials

Ground rod shall be copper clad steel with cladding 13 mils thick. The minimum diameter is 5/8-inch and the minimum length is eight feet. Ground wire shall be AWG # 6 bare, solid copper.

C Construction

Use exothermic welding to connect the ground wire to the rod. Install the rod vertically, or as close to vertical as conditions permit. Select locations with moist soil, if available. Place the rod at least six feet from all other ground rods.

D Measurement

The department will measure Ground Rod by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price each under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.10	Ground Rod	EACH

Payment is full compensation for installation of the ground rod and ground wire; welding and connections at both ends of the ground wire.

39. General Requirements for Building Construction

These general requirements are applicable to the following bid items for the rest area building construction:

Rest Area Building General

Rest Area Building Plumbing

Rest Area Building HVAC

Rest Area Building Electrical

Maintenance Building General

Maintenance Building Plumbing

Maintenance Building HVAC

Maintenance Building Electrical

Work related to the work requirements will not be paid separately but shall be included in the applicable contract unit prices.

Section 00 01 05 - Certifications Page

Sparta Rest Area No. 16

I-90 Westbound

Sparta, Wi

ISG NO. 22-2704











END OF SECTION

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END OF SECTION

Section 00 31 00 - Available Project Information

PART 1 GENERAL

1.1 SUBSURFACE INVESTIGATION REPORT

A. A copy of the geotechnical evaluation report with respect to the building site is available by contacting Joseph Coughlin, 608-261-8975, Joseph.Coughlin@dot.wi.gov:

1. Title: Geotechnical Evaluation Report for La Crosse - Sparta Rest Area No. 16, IH 90, Monroe County.

2. Date: February 10, 2023.

3. Prepared by: American Engineering Testing, Inc.

B. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

Section 01 30 00 - Administrative Requirements

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.

B. Project Coordinator.

C. Preconstruction meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Requests for Information (RFI) procedures.

G. Submittals for review, information, and project closeout.

H. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

B. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.

1.4 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:

1. Requests for Information (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

1.5 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for employee access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

F. Coordinate engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:

1. Requests for Information.
2. Shop drawings, product data, and samples.
3. Test and inspection reports.
4. Design data.
5. Manufacturer's instructions and field reports.
6. Applications for payment and change order requests.
7. Progress schedules.
8. Coordination drawings.
9. Correction Punch List and Final Correction Punch List for Substantial Completion.
10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required:

1. Owner.
2. Architect.
3. Contractor.

C. Note: The following agenda items are not intended to be the final or a complete list of the items that will be discussed. A complete agenda will be distributed at the preconstruction meeting.

D. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, Owner and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, requests for information, Change Orders, and Contract closeout procedures.
7. Scheduling.
8. Shop drawings submittal, review times, and overall process.
9. Electronically submitted file and formating requirements and procedures.

10. Open for comments; attendees are encouraged to bring other topics or concerns up for discussion at this time.

E. Architect will record minutes and distribute copies within two days after meeting to participants, with copies to the contractor, owner, participants, and those affected by decisions made.

3.2 PROGRESS MEETINGS

A. Architect will schedule and administer meetings throughout progress of the Work at maximum bi-weekly intervals.

B. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Current compliance status of electronically submitted file and formating requirements and procedures.
13. Other business relating to work.

D. Architect will record minutes and distribute copies within two days after meeting to participants, with copies to the Contractor, Owner, participants, and those affected by decisions made.

3.3 CONSTRUCTION PROGRESS SCHEDULE

A. Within 7 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 5 days.

C. Within 7 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 5 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.4 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:

1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.

a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.

b. Do not forward requests which solely require internal coordination between subcontractors.

2. Prepare in a format and with content acceptable to Owner.

a. Use AIA G716 - Request for Information or equivalent form.

3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

a. All pages of PDF shall be formatted to 8 1/2x11 or 11x17 whenever possible.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.

2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

a. The Owner reserves the right to assess the contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.

1. Official Project name and number, and any additional required identifiers established in Contract Documents.

2. Owner's, Architect's, and Contractor's names.

3. Discrete and consecutive RFI number, and descriptive subject/title.

4. Issue date, and requested reply date.

5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).

6. Annotations: Field dimensions and/or description of conditions which have engendered the request.

7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

1. Indicate current status of every RFI. Update log promptly and on a regular basis.

2. Note dates of when each request is made, and when a response is received.

3. Highlight items requiring priority or expedited response.

4. Highlight items for which a timely response has not been received to date.

5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.

2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.

3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.

4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.5 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.

2. Shop drawings.

3. Samples for selection.

4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute according to SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.6 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.7 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.8 SUBMITTAL PROCEDURES

A. General Requirements:

1. All submittals shall be submitted to the Architect through the Project Coordinator - No Exceptions.
2. All shop drawings shall be submitted no later than 45 days after execution of the contract.
3. All submittals shall be submitted with a cover page equivalent to the the shop drawing submittal form attached to this section.
4. PDFs by e-mail is the preferred method; coordinate with Architect/Engineers's representative.
    a. Refer to "Requirements for Electronically Submitted Shop Drawings" attached to this section.
    b. Where a construction management software progarm is used all submittals shall be submitted through that service.
        (1) All submittals shall include an approved cover sheet as the documents need to be able to live outside those progarms.
5. By submitting submittals, the Project Coordinator represents to Architect that Project Coordinator has:

a. Reviewed and approved them.

b. Determined and verified materials, field measurements, and field construction criteria related thereto, or will do so.

c. Checked and coordinated the information contained within such submittals with the requirements of the Work of the Contract Documents.

6. Submittals that do not appear to be reviewed and approved will be returned to the Project Coordinator without the Architect's review. Time delays for this breach in procedure will be at the sole expense of the Project Coordinator.

7. Sequentially identify each item. For revised submittals use original number and a sequential alphabetical suffix.

8. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is according to the requirements of the work and Contract Documents.

a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.

9. Schedule submittals to expedite the Project, and coordinate submission of related items.

a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.

c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.

10. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.

11. Provide space for Contractor and Architect review stamps.

12. When revised for resubmission, identify all changes made since previous submission.

13. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

14. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

15. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:

1. Submit only information required by individual specification sections.

2. Collect required information into a single submittal.

3. Submit concurrently with related shop drawing submittal.

4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.

2. Do not reproduce Contract Documents to create shop drawings.

3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:

1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

END OF SECTION

SECTION 01 3000 -- ATTACHMENT

SHOP DRAWING SUBMITTAL FORM

Architects Project No: 22-27044 Date: _____

Project Name: Sparta Rest Area No. 16, I-90 Westbound, Sparta WI

Specification Section Number: _____Shop Drawing # _____

Specification Section Name: _

Description: _

Subcontractor or Supplier Approval:	**General Contractor or Construction Manager Approval:**
Architect / Engineer Review:	**Other Reviews and Comments:**

Section 01 35 10 - Structural Testing and Special Inspection

PART 1 GENERAL

1.1 INTENT AND CONDITIONS

A. Intent

1. Define and coordinate structural testing and special inspection services.
2. Define and coordinate conventional testing and inspection services.
3. Provide greater confidence that the specified work is constructed in compliance with the contract documents and Chapter 17 of the 2021 International Building Code.
4. Testing and Inspection services are intended to assist in determining probable compliance of the work with requirements specified. These services do not relieve the Contractor of responsibility for compliance with the requirements of the contract documents.

B. Conditions

1. If inspection of fabricator's work is required, the Owner's representative may require testing and inspection of the work at the plant, before shipment. Owner, Architect and Structural Engineer of Record (SER) reserve the right to reject material not complying with the contract documents.
2. Testing and inspection shall be performed according to the industry standard used as the reference for the specific material or procedure unless other criteria are specified. In the absence of a referenced standard, tests shall be accomplished according to generally accepted industry standards.
3. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection if defective work or materials are discovered, nor shall it obligate Owner to accept such work.

1.2 RELATED REQUIREMENTS

A. Refer to PART 3 for technical scope sections regarding specific qualifications, inspections, tests, frequency and standards required.

1.3 DEFINITIONS

A. Testing – Evaluation of systems, primarily requiring physical manipulation and analysis of materials, according to approved standards.

B. Inspection – Evaluation of systems, primarily requiring observation and engineering judgment.

C. Structural Testing and Special Inspection – Structural Testing and Special Inspection Services herein include items required by the 2021 International Building Code, and other items which in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.

D. Conventional Testing and Inspection – Conventional Testing and Inspection Services herein describe those items not specially required by Code but may be considered essential to the proper performance of the building systems.

E. Architect of Record – The prime consultant in charge of overall design and coordination of the project.

F. Structural Engineer of Record (SER) – The Licensed Engineer in responsible charge of the structural design for the project.

G. Licensed Structural Engineer: – A professional engineer with education and experience in the design of structures similar to this project licensed to practice in the state in which the project is located.

H. Testing Agency (TA) – The properly qualified firm performing testing services.

I. Special Inspector (SI) – A properly qualified individual or firm performing special inspections.

J. Building Official – The Officer or his duly authorized representative charged with the administration and enforcement of the 2021 International Building Code.

K. Continuous –The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

L. Periodic –The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

1.4 REFERENCES

A. ASTM E329-13 - Standard Specification for Agencies Engaged in Construction, Inspection, Testing, or Special Inspection.

B. ASTM E543-21 - Standard Specification for Agencies Performing Nondestructive Testing.

C. ASTM C1077-17 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.

D. ASTM C1093-19 - Standard Practice for Accreditation of Testing Agencies for Masonry.

E. ASTM D3740-19 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

F. AISC Steel Construction Manual 15th Edition (2017)

G. 2021 International Building Code.

H. See technical sections of PART 3 for specific references.

1.5 QUALIFICATIONS

A. Testing Agency (TA) – The testing agency shall be an approved independent testing agency acceptable to the Owner, Architect, SER and as noted below:

1. Authorized to operate in the state in which the project is located and experienced with the requirements and testing methods specified in the technical scope sections of PART 2.

2. Meeting applicable requirements of Section 1.04 "References".

3. Testing equipment shall be calibrated at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards, or to accepted values of natural physical constants.

B. Special Inspector (SI) – The special inspector shall be under the direct supervision of a registered civil/structural engineer, experienced with the type of work requiring structural testing and special inspection.

1. The categories of special inspector are:

a. Special Inspector - Technical I, II, and III: Usually an employee of a testing agency.

b. Special Inspector - Structural I and II: Preferably an employee of the SER's firm.

2. Unique special inspector requirements, for specific materials and system, are noted in related technical specification sections.

1.6 RESPONSIBILITIES

A. Structural Testing and Special Inspection

1. Special Inspectors:

a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.

b. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.

c. Test and/or inspect the work assigned for conformance with the building department approved design drawings, specifications and applicable material and workmanship provisions of the Code. Perform testing and inspection in a timely manner to avoid delay of work.

d. Bring discrepancies to the immediate attention of the contractor for correction, confirm that they are corrected and, if uncorrected after a reasonable period of time, bring to the attention of the Structural Engineer of Record, the Building Official, and to the Architect.

e. Submit test and/or inspection reports to the Building Official, Contractor, the Structural Engineer of Record, and other designated persons according to the Structural Testing and Special Inspection Summary Schedule.

f. Submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the Code.

2. Testing Agency:

a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.

b. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.

c. When engaged as a special inspector, provide structural testing and special inspection services as previously described.

3. Architect of Record (or other prime consultant):

a. Complete and sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction. Provide a completed copy of the schedule to all signed parties including Building Official.

b. If appropriate, arrange and attend a pre-construction meeting to review the scope of structural testing and special inspection. Include Contractor, Building Official, SER, Testing Agency and other parties concerned.

c. Coordinate the flow of reports and related information to expedite resolution of construction issues.

4. Structural Engineer of Record (SER):

a. Identify items requiring structural testing and special inspection including special cases.

b. Define "type" of special inspector required for "description" of work indicated on the structural testing and special inspection schedule.

c. Complete and sign the Structural Testing and Special Inspection Summary Schedule prior to commencement of construction.

d. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.

e. Review reports submitted by special inspectors.

f. If engaged as a special inspector, provide structural testing and special inspection services as previously described.

5. Contractor:

   a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.

   b. Coordinate efforts to gain signatures of all signing parties other than the Architect and Structural Engineer of Record (SER).

   c. If requested, attend a pre-construction meeting to review the scope of structural testing and special inspection.

   d. Post or make available the Structural Testing and Special Inspection Summary Schedule within its office at the job site. Also, provide adequate notification to those parties designated on the schedule so they may properly prepare for and schedule their work.

   e. Provide the special inspectors access to the approved drawings and specifications at the job site.

   f. Review reports submitted by special inspectors.

   g. Retain at the job site all reports submitted by the special inspectors for review by the building official upon request.

   h. Correct in a timely manner, deficiencies identified in inspection and/or testing reports.

   i. Provide the special inspector safe access to the work requiring inspection and/or testing.

   j. Provide labor and facilities to provide access to the work and to obtain, handle and deliver samples, to facilitate testing and inspection and for storage and curing of test samples.

   k. Verification of conformance of the work within specified construction tolerances is solely the Contractor's responsibility.

6. Fabricator:

   a. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencing construction.

   b. Submit a Certificate of Compliance to the Building Official, Special Inspector, and Structural Engineer of Record that the work was performed according to the approved plans and specifications.

7. Building Official (Typical responsibilities noted for information only):

   a. Determine work, which in the Building Officials opinion, involves unusual hazards or conditions according to the 2021 International Building Code.

   b. Review special inspector qualifications.

   c. Accept and sign the completed Structural Testing and Special Inspection Summary Schedule.

   d. Review all fabricators who perform work in their shop, which requires special inspection.

   e. Review reports and recommendations submitted by the special inspectors.

   f. Review the "final signed reports" submitted by the special inspector(s). These documents should be accepted and approved by the building department prior to issuance of a Certificate of Occupancy.

8. Owner:

    a. Establish direct funding to provide for cost of structural testing and special inspection services.

    b. Provide special inspector with approved design drawings, specifications and approved shop drawings.

    c. Provide special inspectors and testing agencies with full access to site at all times.

    d. Sign the Structural Testing and Special Inspection Summary Schedule in conjunction with other responsible parties prior to commencement of construction.

B. Conventional Testing and Inspection

1. Testing Agency:

    a. Test or inspect the work assigned, for conformance with building department approved plans, specifications and applicable workmanship provisions of the 2021 International Building Code.

    b. Bring non-conforming items to the immediate attention of the Contractor, and if uncorrected to the Architect of Record.

    c. Submit test and/or inspection reports to the Architect of Record, the Contractor and other designated persons.

2. Contractor:

    a. Provide adequate notification to testing agency so they may properly prepare for and schedule their work.

    b. Provide testing agency with access to the approved design drawings, approved shop drawings and specifications at the job site.

    c. Correct in a timely manner, deficiencies identified in test and/or inspection reports.

    d. Provide testing agency with safe access to the work requiring testing and inspection.

    e. Provide labor and facilities to provide access to the work and to obtain and handle samples, to facilitate testing and inspection and for storage and curing of test samples.

    f. Verification of conformance of the work within specified construction tolerances is solely the Contractor's responsibility.

3. Architect of Record (or other prime consultant):

    a. Coordinate the flow of reporting and related information to expedite resolution of construction issues.

C. Inspections by Building Official

1. Contractor shall provide adequate notice for inspections performed by the Building Official, as required by the 2021 International Building Code, and local ordinance.

D. Periodic Site Observations by Design Consultant

1. Special structural testing and inspection, conventional testing and inspection, and periodic inspections by the Building Official do not preclude the normal field involvement and site observations by Architect or Structural Engineer of Record, nor shall it relieve the Contractor of any responsibility to complete the work according to the approved drawings and specifications.

E. Limits of Authority

1. Testing agents and/or special inspectors may not waive or alter contract requirements, or approve or accept any portion of the work unless specifically authorized by the Architect or Structural Engineer of Record. They may not assume any duties of the Contractor, and they have no authority to stop or reject "Work".

1.7 PAYMENT

A. Owner shall directly employ and pay for services of the special inspectors to perform required Structural Testing and Special Inspection.

B. Owner shall employ and pay for services of the testing agency to perform required Conventional Testing and Inspection.

C. Unless noted otherwise, the Contractor shall provide and pay for all materials, samples, mock-ups, and assemblies required for testing and inspection and shall pay for all shipping costs related to delivery of this work. Testing agency will pay for shipping costs of samples transported from site to lab.

D. If exploratory work is required to determine the cause of defects, the cost of such work shall be paid by the Contractor, if the work is found to be defective, in the judgment of the Architect/Engineer. Contractor shall reimburse the Owner for all costs incurred in this event.

E. Any tests required to qualify the Contractor, or the workmen for any phase of the work, shall be performed at no additional cost to the Owner.

1.8 INSPECTION NOTICE

A. Contractor shall provide minimum of 24 hours notice for all items requiring testing or inspection. Items requiring testing and inspection services prior to or during placement shall not be placed until testing and inspection services are available. Items requiring testing and inspection services after placement shall not be enclosed or obscured until testing and inspection services are performed.

1.9 REPORTS

A. Testing agency and/or special inspectors shall submit reports according to the Structural Testing and Special Inspection Summary Schedule and shall conduct and interpret tests and inspections and state in each report whether; (1) test specimens and observations comply with Contract Documents, and specifically state any deviations, (2) record types and locations of defects found in work, (3) record work required and performed, to correct deficiencies.

B. Reports for structural testing and special inspection, shall be submitted in timely manner to the Contractor, Building Official, SER, and Architect of Record.

1. Submit reports for ongoing work, to provide the information noted below:

a. Date issued.

b. Project title and number.

c. Firm name and address.

d. Name and signature of tester or inspector.

e. Date and time of sampling.

f. Date of test or inspection.

g. Identification of product and specification section.

h. Location in project, including elevations, grid location and detail.

i. Type of test or inspections.

j. Results of tests or inspections and interpretation of same.

k. Observations regarding compliance with Contract Documents or deviations there from.

2. Submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the code.

C. Reports for conventional testing and inspection shall be submitted in a timely manner to the Contractor and the Architect of Record.

1.10 FREQUENCY OF TESTING AND INSPECTION

A. For detailed requirements see technical sections of PART 3.

1.11 PROTECTION AND REPAIR

A. Upon completion of testing, sample-taking, or inspection, the Contractor shall repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed surfaces, as judged solely by the Architect/Engineer of Record. Protect work exposed by or for testing and/or inspection and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing and/or inspection.

1.12 TESTS TO DEMONSTRATE QUALIFICATION

A. If the Contractor proposes a product material, method, or other system that has not been pre-qualified, the Architect may require applicable tests, to establish a basis for acceptance or rejection. These tests will be paid for by the Contractor.

B. The Architect/Engineer of Record reserves the right to require certification or other proof that the system proposed, is in compliance with any tests, criteria or standards called for. The certificate shall be signed by a representative of an independent testing agency.

PART 2 MATERIALS (NOT USED)

PART 3 SCOPE OF TESTING AND INSPECTION

3.1 STRUCTURAL TESTING AND SPECIAL INSPECTION PROGRAM SUMMARY

A. The parties involved shall complete and sign the Structural Testing and Special Inspection Summary Schedule. The Program, including Summary Schedule, shall be submitted to the building official for approval prior to issuance of a building permit. The competed schedule includes the following:

1. A specific listing of the items requiring inspection and testing.

2. The associated technical scope sections that define the applicable standards by which to judge conformance with the approved plans and specifications according to 2021 International Building Code. The technical scope sections should also include the degree or basis of inspection and testing; i.e., intermittent/will-call or full-time/continuous.

3. The frequency of reporting, i.e., weekly, monthly, per test/inspection, per floor, etc.

4. The parties responsible for performing the inspection and testing work.

5. The required acknowledgments by each designated party.

3.2 CONVENTIONAL TESTING AND INSPECTION

A. (Not Used)

3.3 STRUCTURAL TESTING AND SPECIAL INSPECTION STATEMENT OF SPECIAL INSPECTIONS

A. Refer to attached Program Summary Schedule for this project. It includes a schedule of Special Inspection services applicable to this project and the identity of agencies to be retained for conducting these inspections and tests.

B. The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official, the Architect and Structural Engineer of Record. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the

attention of the Building Official, the Architect and SER. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

C. Interim reports shall be submitted to the Building Official, Architect, and SER.

D. A Final Report of Special Inspections documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

3.4 TECHNICAL SECTIONS

A. **Section 31 22 00 - Earthwork - Grading, Excavation Filling**

1. (Not Used)

2. Definitions

a. Refer to PART 1 for standard definitions.

b. Special Inspector – Technical

(1) Technical I: Technician shall be under the direct supervision of a Technical III. Work shall be performed in a qualified geotechnical/testing laboratory.

(2) Technical II: Technical with a minimum of 2 years experience, or a graduate engineer, and is an employee of a qualified and approved geotechnical/testing laboratory, under the direct supervision of a Technical III.

(3) Technical III: A civil/geotechnical engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved geotechnical/testing laboratory. This licensed engineer shall review and approve all final field reports.

3. Structural Testing and Special Inspection Requirements (Item and Frequency and Qualifications)

a. Classification of materials used and encountered during construction per ASTM:D2488 and ASTM:D2487. Technical I

b. Performance of laboratory testing of materials, as needed (Proctor, Sieve Analysis, Atterberg Limits, Consolidation Test, etc.). Technical I

c. Field Density Tests: Technical I

d. Provide periodic results of field compaction and laboratory work for general compliance with Contract Documents and Geotechnical Reports. Technical I

e. Observe all subgrades/excavation bases below footings and slabs and verify design bearing capacity is achieved. Technical II

f. Document presence of groundwater within excavations. Technical I

g. Provide reports of subgrade observations for general compliance with Contract Documents and Geotechnical Report. Technical II

h. Verify cut and fill slopes as specified in the contract documents. Technical III

4. Conventional Testing and Inspections Requirements

a. Contractor shall verify that footings comply with frost depth requirements and shall report any variances to the SER in a timely manner.

B. **Section 03 3000 - Cast-in-Place Concrete**

1. General

a. Structural testing is required for all concrete. Thus, Special inspections as outlined below are not required for the following items:

(1) Isolated spread footings of buildings three stories or less in height that are fully supported on earth or rock.

(2) Strip footings of buildings three stories or less in height that are fully supported on earth or rock, where the footings support walls of light frame construction, the footings are designed according to Table 1809.7, or the footing structural design is based on a f 'c no greater than 2500 psi.

(3) Non-structural slabs on grade, including prestressed slabs on grade when effective prestress in concrete is less than 150 pounds per square inch.

(4) Concrete foundation walls constructed according to Table 1807.1.6.2.

2. Definitions

a. Refer to PART 1 for standard definitions.

b. Special Inspector – Technical

(1) Technical I: ACI Certified Grade I inspector. Inspector shall be employed by a testing laboratory, under the direct supervision of a Technical III.

(2) Technical II: ACI Certified Grade II inspector. Inspector shall be employed by a testing laboratory, under the direct supervision of a Technical III.

(3) Technical III: A civil/structural engineer regularly engaged in this type of work, with a minimum of 4 years experience and licensed in the State in which the project is located and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approved all reports.

(4) Testing laboratory shall have C.C.R.L. certification at the National Bureau of Standards.

c. Special Inspector – Structural

(1) Structural I: Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.

(2) Structural II: Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the State in which the project is located. The licensed engineer shall review and approve all inspection reports.

(3) Special Inspector - Structural may be an employee of the SER.

3. Structural Testing and Special Inspection Requirements (Item and Frequency and Qualifications)

a. Sample and test all cast in place concrete; Technical I.

(1) Prepare compression test specimens (ASTM C31), one set of four standard cylinders of concrete for each compressive strength test, mold and store cylinders for laboratory-cured specimens. Specimens shall be 4x8 cylinders except where an alternate size has been approved by the structural engineer.

(2) Perform compressive strength tests (ASTM C39). One set of four cylinders for each day's pour between one and 25 cubic yards. If

a day's pour exceeds 25 cubic yards, one set of four cylinders for each additional 50 cubic yards, or fraction thereof. One specimen at seven days, two at 28 days, and one specimen retained in reserve for later testing if required. For post tensioned concrete, make and test an additional cylinder at three days to verify strength prior to stressing. (When frequency of testing will provide less than five strength tests for a given class of concrete, conduct at least five strength tests from randomly selected batches. If fewer than five batches are used, conduct one test from each batch.)

(3) Slump (ASTM C143): One test at point of discharge for each set of compression test specimens; additional tests when concrete consistency appears to have changed.

(4) Air entrainment (ASTM C231): Test the first batch of air entrained concrete and one additional test for each set of compression test specimens.

(5) Concrete Temperature: Test concrete temperature hourly when air temperature is 40F and below and when 80F and above, and each time a set of compression test specimens is made.

b. On a periodic basis, perform concrete mix verification; Technical I.

(1) Verify mixer truck trip ticket conforms to approved mix design.

(2) Verify that total water added to mix on site does not exceed that allowed by concrete mix design.

(3) Verify that concrete quality is indicative of adequate mixing time, consistency, and relevant time limits. Technical I

c. On a continuous basis, inspect preparation and placement of all concrete.

(1) Verify the following; Structural I:

(1) Verify acceptable general condition of concrete base prior to placement.
(2) Verify concrete has been sampled for required concrete tests.
(3) Verify that concrete conveyance and depositing avoids segregation and contamination.
(4) Verify that concrete is properly consolidated.
(5) Verify reinforcement remains at proper location.
(6) Unless noted, inspections shall be on a continuous basis. Inspections may be performed on a periodic basis for the following types of work:

d. On a periodic basis, observe protection and curing methods for all concrete requiring inspections as outlined above; Structural I:

(1) Verify specified curing procedures are followed.

(2) Verify specified hot and cold weather procedures are followed.

e. On a continuous basis, inspect all bolts installed in concrete prior to and during concrete placement; Structural I:

(1) Verify specified size, type, spacing, configuration, embedment, and quantity.

(2) Verify proper concrete placement and means have been taken to achieve consolidation around all bolts.

4. Conventional Testing and Inspection Requirements

a. (Not Used)

C. **Section 04 2000 - Masonry**

1. General

   a. Special inspection of masonry is required during preparation of masonry wall prisms or test specimens, sampling and placing of masonry units, placement of structural reinforcement, cleanout of grout space immediately prior to closing of elements, and during all grouting operations.

   b. Inspections noted below as being periodic shall be performed at least once per 500 square feet, except 100% of shear walls, masonry beams, and masonry columns shall be inspected.

2. Definitions

   a. Refer to PART 1 for standard definitions.

   b. Special Inspector – Technical

      (1) Technical I: Technician shall be under the direct supervision of a Technical III regularly engaged in testing and inspection of this type of work. The licensed engineer shall review and approve all inspection reports.

      (2) Technical II: Graduate civil/structural engineer, with experience in this type of work. Supervised by a Technical III. The licensed engineer shall review and approve all inspection reports.

      (3) Technical III: A civil/structural engineer regularly engaged in this type of work with a minimum of 4 years experience, licensed in the State in which the project is located, and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approve all reports.

   c. Special Inspector – Structural

      (1) Structural I: Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a Structural II.

      (2) Structural II: Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state in which the project is located. The licensed engineer shall review and approve all inspection reports.

      (3) Special Inspector - Structural may be an employee of the SER.

3. Structural Testing and Special Inspection Requirements – **Level B** (Item and Frequency and Qualifications)

   a. Samples and Tests for Special Inspections

      (1) Masonry Unit Test – shall be performed according to 2021 IBC Section 2105 and 2021 IBC Section 1705.4, as follows:

         (1) Units conform to ASTM C 55 or ASTM C 90.
         (2) Test units according to ASTM C 140 prior to the start of construction.
         (3) During construction one set of tests for each 5,000 SF of wall area, but not less than on set for the project. Technical I

      (2) Prism Tests - number and frequency according to 2021 IBC Section 2105, as follows:

         (1) A set of 3 masonry prisms for each masonry type requiring testing, shall be built and tested according to ASTM C1314 prior to the start of construction.

(2) During construction a set of 3 masonry prisms shall be built and tested according to ASTM C1314 for each 5,000 SF of wall area in question, but not less than one set of 3 masonry prisms for the project.

(3) The compressive strength of masonry determined according to ASTM C1314 for each set of prisms shall equal or exceed specified f'm. Technical I

(3) Preparation, storage, handling of prism tests. (Contractor shall provide labor and materials to construct all prism tests.) Technical I

b. Masonry Preparation and Placement

(1) Base Conditions: On a periodic basis, verify that masonry bearing surfaces are clean.

(2) Condition of Units: On a periodic basis, verify that masonry units are clean and sound and dry.

(3) Placement: On a periodic basis, inspect laying of masonry units for the following: nominal unit widths, stack or running bond, proper thickness and tooling of mortar joints, acceptable depth of furrowing of bed joints. Note temperature at time of inspection.

(4) Joints: On a periodic basis, inspect construction, expansion and contraction joints for location and continuity of steel.

(5) On a periodic basis, verify hot and cold weather procedures are followed.

(6) On a periodic basis, verify wall cavities are protected against entry of precipitation. Structural I

c. Masonry Reinforcement:

(1) Vertical Reinforcement: On a periodic basis, inspect placement and alignment of vertical bars and dowels for size, grade and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls, and positioning of steel.

(2) Horizontal Reinforcement: On a periodic basis, inspect horizontal joint reinforcement steel and masonry reinforcement bars for size, length of lap splices, dowels, clearances between bars, clearance to masonry units and outside face of walls, and alignment.

(3) Ties: On a periodic basis, inspect ties in masonry for type, straightness, embedment, spacing and size.

(4) Dowels and Anchors: On a periodic basis, inspect the installation of masonry anchor bolts, joist anchors, inserts, straps, and dowels. Structural I

(5) Welding Reinforcement: Welded splices should be done only upon approval; continuous inspection during welding.

d. Prior to Masonry Grouting and Capping

(1) Grout Spaces: On a periodic basis, verify that grout spaces are correctly sized and clean, cleanouts are closed after inspection and grout barriers are in place before grouting.

(2) Reinforcement: On a periodic basis, verify placement of reinforcement and connectors remains consistent with construction documents.

(3) Site Prepared Grout: On a periodic basis, verify proportions of site prepared grout are consistent with previously submitted materials. Structural I

e. During Grouting Operations

(1) Grouting: On a periodic basis, verify proper grouting technique including consolidation to approved height of grout space, reconsolidation and vibration.

(2) Dry Packing: On a periodic basis, verify proper application of dry packing. Structural I

f. General Compliance

(1) On a periodic basis, verify that work is being performed according to the contract documents and the approved submittals and that materials used are consistent with prior submittals. Structural I

4. Conventional Testing and Inspection Requirements

a. Not Used.

END OF SECTION

Structural Testing and Special Inspection Program Summary Schedule

Project Name: Sparta Rest Area No. 16, I-90 Westbound Project No. 22-27044
Location: Sparta WI Permit No. _____ (1)

Technical (2)		Description (3)	Type of Inspector (4)	Specific Report Frequency (5)	Assigned Firm (6)
Section	Article				
31 2200	1705.6	Soils	TA	IBC Table 1705.6	
31 6613	1705.7	Aggregate Piers	TA	MBC Table 1705.7	
03 3000	1705.3	Cast-In-Place Concrete	TA	IBC Table 1705.3	
04 2000	1705.4	Masonry	TA	Per IBC 1705.4	
05 4400	1705.11.3	Wind-Resisting Components	SI-T	Per IBC 1705.11.3	
05 4400	1705.2.4	Cold-Formed Steel Trusses	SI-T	Per IBC 1705.2.4	

Note: This schedule shall be filled out and included in a Special Structural Testing and Inspection Program.

(If not otherwise specified, assumed program will be "Guidelines for Special Inspection & Testing".)

(1) Permit No. to be provided by the Building Official
(2) Referenced to the specific technical scope section in the program.
(3) Use descriptions per IBC Chapter 17.
(4) Special Inspector – Technical (SIT); Special Inspector – Structural (SIS)
(5) Weekly, monthly, per test/inspection, per floor, etc. Per section 01 3510 of spec book.
(6) Name of Firm contracted to perform services.

ACKNOWLEDGEMENTS
(Each appropriate representative shall sign below)

Owner: _____ Firm: _____ Date: _____

Contractor: _____ Firm: _____ Date: _____

Architect: _____ Firm: _____ Date: _____

SER: _____ Firm: _____ Date: _____

SI-T: _____ Firm: _____ Date: _____

SI-S: _____ Firm: _____ Date: _____

TA: _____ Firm: _____ Date: _____

F: _____ Firm: _____ Date: _____

If requested by engineer/architect of record or building official, the individual names of all prospective special inspectors and the work they intend to observe shall be identified as an attachment.

Legend: SER = Structural Engineer of Record SI-T = Special Inspector - Technical
TA = Testing Agency SI-S = Special Inspector - Structural F = Fabricator

Accepted for the Building Department By _____ _____ Date _____

Section 01 40 00 - Quality Requirements

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Tolerances.

G. Manufacturers' field services.

H. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.3 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. General: As indicated in individual specification sections.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.

1. Include:

a. Date issued.

b. Project title and number.

c. Name of inspector.

d. Date and time of sampling or inspection.

e. Identification of product and specifications section.

f. Location in the Project.

g. Type of test/inspection.

h. Date of test/inspection.

i. Results of test/inspection.

j. Compliance with Contract Documents.

k. When requested by Architect, provide interpretation of results.

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.

1. Submit report in duplicate within 30 days of observation to Architect for information.

2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.5 QUALITY ASSURANCE

A. Examination of Drawings and Specifications:

1. Upon receipt of Drawings and Specifications verify that documents are complete. Notify Architect should the documents be incomplete.

2. Immediately notify Architect upon finding discrepancies or omissions in the Drawings and Specifications.

3. Drawings and specifications are complementary and do not create a hierarchy.

4. By submitting a bid, bidders agree that they have reviewed, in detail, all Drawings and Specifications issued for bidding purposes.

5. The following will not entitle a contractor to a change order increasing the overall project cost after the project has been awarded:

    a. Selectively choosing less significant content from the drawings or specifications where conflicting information is evident.

    b. Disregarding content that only appears in one part of the Bidding Documents.

6. A written request for clarification during the bidding process will result in an addendum being issued to resolve such errors, inconsistencies, or omissions in the Drawings and Specifications therefore creating a level bidding environment for all bidders.

1.6 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.7 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform other specified testing and inspection.

1. Where indicated in individual specification sections the Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Employment of agency in no way relieves Contractor of obligation to perform Work according to requirements of Contract Documents.

C. Contractor Employed Agency:

1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.

2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.

3. Laboratory: Authorized to operate in the State in which the Project is located.

4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.3 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:

1. Test samples of mixes submitted by Contractor.

2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

3. Perform specified sampling and testing of products according to specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.

6. Perform additional tests and inspections required by Architect.

7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency may not approve or accept any portion of the Work.

3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

2. Cooperate with laboratory personnel and provide access to the Work and to manufacturers' facilities.

3. Provide incidental labor and facilities:

a. To provide access to Work to be tested/inspected.

b. To obtain and handle samples at the site or at source of Products to be tested/inspected.

c. To facilitate tests/inspections.

d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.

5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.4 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.5 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

Section 01 43 39 - Mock-Ups

PART 1 GENERAL

1.1 **SUMMARY**

A. Section Includes:

1. Mockups.

1.2 **DEFINITIONS**

A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

1.3 **SUBMITTALS**

A. Mockup Shop Drawings:

1. Provide plans, sections, and elevations, indicating materials and size of mockup construction.

2. Indicate manufacturer and model number of individual components.

3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.4 **MOCKUPS**

A. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

2. Notify Architect 7 days in advance of dates and times when mockups will be constructed.

3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.

4. Demonstrate the proposed range of aesthetic effects and workmanship.

5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

a. Allow 7 days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed unless otherwise indicated.

B. Mockup Pre-Installation Conference: Before beginning mock-up construction and installation, conduct conference with manufacturer’s representatives, fabricators, installers, Architect, Owner and other interested parties to review procedures, schedules, and coordination of curtain wall installation with other elements of Work.

1.5 **MOCKUP TESTING**

A. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

b. Provide test specimens representative of proposed products and construction.

c. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

d. Provide sizes and configurations of test assemblies and mockups to adequately demonstrate capability of products to comply with performance requirements.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractors. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

B. Representatives of Architect's office and representatives of Owner's office will be present to observe preparation for testing and testing procedures.

1. Notify Architect in advance of testing.

C. Testing of Mockups: Conduct tests according to test procedures specified in individual specification Sections.

PART 2 PRODUCTS (NOT USED)

PART 3 MOCKUP SCHEDULE

3.1 **INTEGRATED EXTERIOR WALL MOCKUP**

A. Integrated Exterior Mockup: Construct integrated exterior mockup according to approved Shop Drawings including all transitions and interfaces between different materials and walls to openings/ curtain wall and storefronts. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1. Mockup Pre-Installation Conference: Before beginning mock-up construction and installation, conduct conference with manufacturer’s representatives, fabricators, installers, Architect, Owner and other interested parties to review procedures, schedules, and coordination of curtain wall installation with other elements of Work.

B. Include the following:

1. Wall Assemblies: All components shown in Exterior Wall Types:

a. Thru-wall flashing and weeps.

b. Aluminum-Framed Entrances and Storefronts with associated glazing types as instructed by Architect.

c. Opening perimeter flashing, blocking, and associated items.

d. Expansion Joint Assembly.

e. Interior finishes will not be required to be installed on the interior side of the exterior building mock-up.

3.2 **RECESSED COAT HOOKS**

A. Install and finish one recessed coat hook of each type for Architect approval. Approved mock-ups may remain as part of the Work.

3.3 **FRP PANEL FINISH IN RESTROOM STALLS**

A. Install FRP panel and trim in one location for Architect approval. Approved mock-up may reamin as part of the Work.

3.4 **OTHER MOCKUPS**

A. In addition to previous items, construct field (project site) mock-ups and samples for review where indicated in individual Specifications Sections.

END OF SECTION

Section 01 60 00 - Product Requirements

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Base specified/scheduled products and design intent.

E. Inconsistencies.

F. Substitutions in general.

G. Substitution limitations.

H. Procedures for Owner-supplied products.

I. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals.

B. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment: Motors for plumbing equipment.

C. Section 23 05 13 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.3 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; 2021.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.1 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. The Contractor shall assure the Owner that all new equipment and materials are asbestos free. The Contractor, subcontractors, and material suppliers are required to provide letters of non-asbestos confirmation with supporting documentation prior to material installations. The Owner may select materials to test for asbestos at any time including prior to and/or after installation. If suspect asbestos materials are tested and found to contain asbestos, the materials shall be abated according to asbestos regulations by an Owner approved consultant and abatement contractor. New asbestos free products shall be re-installed by the Contractor supplying such material. The Contractor shall be responsible for any and all new materials. If asbestos is found in the new materials, the cost for asbestos design, on-site monitoring, abatement, and replacement shall be the responsibility of the Contractor. Owner will collect and pay for the testing of any random suspect asbestos samples.

C. Use of products having any of the following characteristics is not permitted:

1. Made using or containing CFC's or HCFC's.

D. Where other criteria are met, Contractor shall give preference to products that:

1. Are extracted, harvested, and/or manufactured closer to the location of the project.

2. Have longer documented life span under normal use.

3. Result in less construction waste.

E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

2.2 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for No Substitutions: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with or without a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. Products Scheduled on the Drawings by Naming one Manufacturer, but not Indicating Other Approved Manufactures in the Specifications: Use any equivalent product complying with the specifications in general and equivalent to the “Basis of Design” identified in the drawing’s schedules. Pre-bid requests for substitutions are not required.

E. Products that do not meet project specifications may be rejected at any time during the project.

F. Cost associated with replacement product and delay in project schedule due to rejection shall be at sole expense of Contractor.

2.3 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 BASE SPECIFIED/SCHEDULED PRODUCTS AND DESIGN INTENT

A. Certain specification sections will indicate a base manufacturer and will then list other acceptable manufacturers. Similarly, certain specification sections will list multiple acceptable manufacturers but only one of the manufacturers will be scheduled on a plan sheet. In these scenarios, the designer has designed the system with considerations for the base manufacturer or the product scheduled on the plan sheet. It is the responsibility of all bidders, contractors, suppliers to ensure that when bidding using an acceptable manufacturer other than the base manufacturer or the scheduled manufacturer that the design intent is met. Providing a product by an acceptable manufacturer other than the base specified or scheduled manufacturer constitutes a representation that the submitter:

1. Has investigated supplied product and determined that it meets or exceeds the quality level of the base specified/scheduled product.

2. Will provide the same warranty for the supplied product as for the base specified/scheduled product.

3. As a result of differences between the base specified/scheduled product and the other acceptable manufacturers will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

6. Will maintain dimensions, locations, clearances, accesses and other design intent shown on the plan or otherwise provided by the base specified/scheduled product.

3.2 INCONSISTENCIES

A. If there is an inconsistency in the quality and/or quantity of Work required by the Contract Documents, either the greater quality and/or quantity of Work indicated shall be provided according to the Engineer/Architect's interpretation without change in the contract sum.

3.3 SUBSTITUTIONS IN GENERAL

A. Proposed substitutions are required to be equivalent in all aspects to the specified products including but not limited to appearance, quality, and performance.

B. When specified in individual sections actual samples shall be provided a minimum of 12 days prior to the bid due date for Architect's review and approval before products other than those scheduled or specified with be accepted; No Exceptions.

3.4 SUBSTITUTION LIMITATIONS

A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

1. The substantiating data shall provide a side by side comparison consisting of sufficient information to determine acceptability of such products.

C. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Agrees to provide the same warranty for the substitution as for the specified product.

3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

D. Provide complete information on required changes to other Work to accommodate each proposed substitution.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.

G. Substitution Submittal Procedure

1. Transmit each substitution request with the Substitution Request cover letter attached to this specification section.

2. PDFs by e-mail is the preferred method; coordinate with Architect's representative. Only submit paper copies where necessary as follows:

a. Submit five copies of request for substitution for consideration.

3. The submitter shall prepare a single PDF file when submitting by e-mail so that all sheets of a submittal are included in one document. Only ONE major product per submittal is permitted. Each PDF shall contain Bookmarks set to the destination of separate items contained within the file. If the submitter elects to use their own transmittal sheet it shall be a separate attachment.

a. Scans shall be in color, pages shall be oriented correctly, actual sheet sizes for the submittal shall be 11 by 17 inch or 8-1/2 by 11 inch whenever possible, and all content must be legible.

4. Limit each request to one proposed substitution.

5. Multiple proposed substitutions submitted on one form will only be considered when products are directly related. Major products and components should be listed first.

6. Submit shop drawings, product data, certified test results, etc. attesting to the proposed product equivalence. Burden of proof is on proposer.

7. The Architect will reply with a decision to accept or reject request in a timely manner.

H. Substitution Submittal Procedure (after contract award):

1. Requests for Substitutions received after Bid Opening will not be considered except in such cases where it is necessary to make a substitution due to strikes, lockouts, bankruptcy, discontinuance of a product, and similar circumstances. Such Requests for Substitution of materials after Contract Award shall be made in writing to the Architect and shall be made within ten (10) days of the date that the Contractor ascertains they cannot obtain the material or equipment specified.

2. Requests for Substitution will not be considered when they are indicated or implied on Shop Drawings or Product Data submittals without a separate previously submitted Request for Substitution Form, or when acceptance will require substantial revision of the Contract Documents.

3. The Architect with approval by the Owner will be the judge of the acceptability of all Requests for Substitution received after Bid Opening.

3.5 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.

2. Arrange and pay for product delivery to site.

3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.

5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.

2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.

3. Handle, store, install and finish products.

4. Repair or replace items damaged after receipt.

3.6 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products according to manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.7 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products according to manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

J. Prevent contact with material that may cause corrosion, discoloration, or staining.

K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6000 – ATTACHMENT

SUBSTITUTION REQUESTS
Architects Project No: 22-27044 Date: _____
Project Name: Sparta Rest Area No. 16, I-90 Westbound, Sparta WI

Specification Section	Manufacturer Specified	Proposed Manufacturer

Indicate drawing sheet name in lieu of specification section where applicable.

Vendor/Supplier

Name: _____

Address: _____

Contact: _____ E-Mail: _____

Telephone: _____ Fax: _____

Reason for Substitution: _____

_____

_____

Does Specification Allow for Substitutions of Proposers Items? Yes: ___ No: ___

Will the Substitution Provide Cost Savings to the Owner? Yes: ___ No: ___

Are Proposed Substitutions Equivalent/Superior to those Specified? Yes: ___ No: ___

Did you provided marked-up product information showing side by side comparisons for both the specified products and proposed products? Yes: ___ No: ___

I, _____, accept responsibility for coordination of proposed substitution and accept all additional costs resulting from the incorporation of proposed substitution into the Project. (Proposers Signature Required)

For Architect's Use:……Comments: _____

Accepted: ___ Not Accepted: ___ _____

No Action Required: ___ _____

Submission: Incomplete: ___ Too Late: ___ _____

Reviewed By: _____ _____

Date: _____ _____

40. Rest Area Building General, Item SPV.0060.11; Maintenance Building General, Item SPV.0060.15.

A Description

This item consists of the general construction work for the Rest Area Building and Maintenance Building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Rest Area Building General and Maintenance Building General as each individual installation, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.11	Rest Area Building General	EACH
SPV.0060.15	Maintenance Building General	EACH

Payment is full compensation for furnishing all materials and equipment, and for supplying all labor, tools, equipment, and incidentals necessary to complete the work. The contractor can receive prorated payments for this item by submitting a detailed estimate outlining the work completed and the costs associated to the engineer for approval.

Section 03 30 00 - Cast-in-Place Concrete

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundation walls.

D. Concrete reinforcement.

1. Including Structural Fiber Reinforcement.

E. Joint devices associated with concrete work.

F. Concrete curing.

G. Concrete finishing.

1. Floor surfaces to be left exposed.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

B. Section Division 22 - Plumbing Piping Specialties: Mechanical items for casting into concrete.

C. Section Division 26 - Grounding and Bonding for Electrical Systems: Electrical items for casting into concrete. Coordinate location with electrical contractor.

D. Section Division 32 - Exterior Concrete Flatwork. Refer to concrete flatwork for all aspects of exterior concrete flatwork except stoops, aprons, and any other concrete element bearing on the building's foundation walls.

1.3 REFERENCE STANDARDS

A. ACI 207.1R - Guide to Mass Concrete (Re-approved 2012).

B. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI 301 - Specifications for Concrete Construction; 2020.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

E. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials

F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

G. ACI 305R - Guide to Hot Weather Concreting; 2020.

H. ACI 306R - Guide to Cold Weather Concreting; 2016.

I. ACI 308R - Guide to External Curing of Concrete; 2016.

J. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

L. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.

M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.

O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

Q. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

R. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

S. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2023.

T. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

U. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

V. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.

W. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

X. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.

Y. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.

Z. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.

AA. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.

BB. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

CC. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix designs: Submit mix design for each mix showing compliance with specified requirements.

D. Test Reports: Submit report for each test or series of tests specified.

E. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.5 QUALITY ASSURANCE

A. Perform work of this section according to ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.1 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.

2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

3. Form Ties: Contractor's choice of standard product type that will leave no metal within 1-1/2 inches of concrete surface.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

1. Type: Deformed billet-steel bars.

2. Finish: Unfinished, unless otherwise indicated.

B. Synthetic Fiber Reinforcement: Refer to Concrete Materials Herein.

C. Diamond Dowel System: PNA Construction Technologies or Approved Equivalent: www.pna-inc.com.

D. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Do not use clay bricks or similar blocks/chunks of material as rebar chairs. Concrete dobies as rebar chairs are acceptable.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

1. Acquire cement for entire project from same source.

B. Cement: ASTM C150/C150M, Type I - Normal, Type II - Moderate, Portland type; or ASTM C595 Type IL - Portland-Limestone Cement Type.

1. Acquire cement for entire project from same source.

C. Fine and Coarse Aggregates: ASTM C33/C33M.

1. Acquire aggregates for entire project from same source.

2. Provide aggregate free of shale at all slab locations exposed to freeze/thaw action.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ASTM C1240, proportioned according to ACI 211.1.

G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

H. Structural Fiber Reinforcement: ASTM C1116/C1116M.

1. Synthetic Macro-Fiber: FORTA FERRO 600 Macro-Synthetic Fiber. Dosage rate as indicated on the drawings.

a. 3M.

b. Enclid Chemical Company (The), an RPM company.

c. FORTA Corporation.

d. Grace Construction Products, W.R. Grace & Co.

e. Nycon, Inc.

f. Propex Concrete Systems Corp.

g. Sika Corporation.

h. Substitutions: See Section 01 6000 - Product Requirements.

2.4 ADMIXTURES

A. Chemical Admixture:

1. Manufacturers by concrete supplier:

a. Master Builders Solutions: www.master-builders-solutions.com.

b. Grace Construction Products: www.gcpat.com.

c. Fritz-Pak: www.fritzpak.com.

d. Mapei GRT: www.mapei.com.

e. Sika Corporation U.S.: www.usa.sika.com

f. Euclid Chemical: www.euclidchemical.com.

g. Substitutions: See Section 01 60 00 - Product Requirements.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

C. Admixtures shall comply with ASTM C494.

D. Air Entrainment Admixture: ASTM C260/C260M.

2.5 ACCESSORY MATERIALS

A. Underslab Vapor Barrier: Polyethylene or equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.

1. Acceptable Products:

a. Stego Wrap 15 mil, Class A by Stego Industries, LLC: www.stegoindustries.com.

b. Moistop Ultra 15 mil, Class A by Henry Company: www.henry.com.

c. Viper VaporCheck II 15 mil by ISI Building Products: www.isibp.com.

d. WR Meadows 15 mil Perminator HP: www.wrmeadows.com.

e. Substitutions: See Section 01 6000 - Product Requirements.

2. Vapor Barrier Accessories: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor barrier.

3. Location: Use at and adjacent (96 inches) to locations with Moisture-Sensitive Flooring Materials; refer to ACI 302.2R-06.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.

2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

C. Epoxy Grout Systems: Where indicated provide Hilti Hit-Hy 200 Epoxy System; other indicated systems; or approved equivalent system.

1. Hilti: www.hilti.com.

2. Substitutions: See Section 01 6000 - Product Requirements.

2.6 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

1. Products:

a. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.

b. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Expansion-Joint Filler: Polyethylene/polypropylene semi-rigid closed-cell backing complying with ASTM D 3575/ASTM D 8139/ASTM D 1751, 1/2 inch thick and full depth of slab less 1/2 inch with peel-off feature. Provide product by Master Builders Solutions, W.R. Meadows, Namaco, or equivalent.

1. Place peel-off feature at top of slab when sealants are specified. Remove peel-off portion of expansion-joint filler prior to application of sealants.

2. Place peel off feature at bottom of slab when no sealants are specified.

C. Plate Dowel System: Steel plate dowel and plastic dowel sleeve; with integral fasteners for attachment to formwork.

2.7 CURING MATERIALS

A. Liquid Membrane Curing Compound: ASTM C 309, Type 2, Class B, White Pigmented.

1. Product: L&M CURE R2 by Laticrete or approved equivalent.

a. Other Approved Products:

(1) SpecRez White by SpecChem.

2. Application Locations: Exterior Concrete surfaces unless indicated otherwise. Finish surfaces to a light broom finish prior to applying curing compound.

B. Moisture-Retaining Sheet: ASTM C171.

1. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

2.8 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Materials In General: Do not use materials or combinations thereof that will result in a reaction that is detrimental to the structural integrity or visual appearance of concrete.

E. Normal Weight Concrete: Refer to structural notes on the drawings.

2.9 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

1. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use latex bonding agent only for non-load-bearing applications.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade according to ASTM E 1643 and manufacturer's written instructions; place sheets in position with longest dimension parallel with direction of pour.

1. Vapor Retarder Over Granular Fill: Install compactable granular fill before placing vapor retarder as shown on the drawings. Do not use sand unless indicated otherwise.

2. Install vapor barrier in lieu of retarder at indicated locations. Refer to accessory materials of this section.

3. Level and compact base material.

4. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the Architect or (b) where obstructed by impediments (such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier). At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.

5. Lap joints minimum 6 inches and seal with manufacturer's recommended tape.

6. Apply seam tape to a clean and dry vapor barrier.

7. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

8. Avoid the use of non-permanent stakes driven through vapor retarder.

9. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.

10. Repair damaged vapor retarder before covering with vapor barrier material of similar (or better) permeance, puncture and tensile.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

3.4 PLACING CONCRETE

A. Place concrete according to ACI 304R.

B. Place concrete for floor slabs according to ACI 302.1R.

C. Ensure reinforcement, inserts, and other similar items will not be disturbed during concrete placement.

D. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.5 SLAB JOINTING

A. Locate joints as indicated on drawings.

1. If no pattern is shown, contractor shall provide saw cut joint layout according to the "Control Joint Placement Guidelines" and notes on the drawings. Refer to the structural drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 24 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

1. Do not exceed 2 inches deep when/if slab thicknesses are greater than 8 inches.

E. Doweled Joints: Install diamond plate dowels and support assemblies at joints where indicated in compliance with manufacturer's written instructions. Size and spacing of diamond plates shall be in compliance with ACI 302.1.

F. Construction Joints: Where not otherwise indicated, use materials compatible with plate dowel system steel plate dowel and plastic dowel sleeves with integral fasteners for attachment to formwork.

3.6 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Refer to structural notes on the drawings.

3.7 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

1. Where indicated install mechanical plugs for tie holes according to manufacturers instructions.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide other finishes as follows:

1. Grout-Cleaned Finish (Class A per ACI 347): Wet concrete surfaces and apply grout of a consistency of thick paint to coat surface and fill small holes. Mix one part portland cement to one and one-half parts fine sand with 1:1 moisture 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.

a. Locations: Provide this finish only where indicated on the drawings.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.

2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

a. Installation of sealant is recommended prior to installation of floor sealers to prevent the need for cleaning of saw cut joints for proper sealant adhesion.

b. Chemical Curer/Sealer/Dustproofer/Hardener(When Applicable): Apply product per manufacturer's instructions after curing and protection procedures are complete.

(1) Acceptable Product:

(1) Laticrete: www.laticrete.com.
(2) Product: L&M Dress & Seal; Acrylic Cure, Sealer, and Dustproofer.
(01) Location: Storage/mechanical/exposed areas not to receive other finishes.
(3) Product: L&M Seal Hard; Concrete Sealer, Densifier, Chemical Hardener.
(01) Location: Garage/shop/warehouse type areas.

(2) Other Acceptable Manufacturers:

(1) Dayton Superior Corporation: www.daytonsuperior.com.
(2) Master Builders Solutions: www.master-builders-solutions.com.
(3) Ashford Formula by Curecrete Distribution, Inc: www.ashfordformula.com.
(4) L.M. Scofield Company: www.scofield.com.
(5) The Euclid Chemical Company: www.euclidchemical.com.

(3) Substitutions: See Section 01 6000 - Product Requirements.

3. Fiber Reinforced Floor Slabs: At exposed floor slabs, or where exposed floor slabs are covered with a thin floor finish, remove fibers flush with the surface of the floor slab. Accomplish removal by any means necessary. Perform removal only where the exposed or popped fibers negatively affect the intended floor finish.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

F. At exterior slabs, aprons, and other horizontal locations provide a light broom finish and liquid membrane curing compound finish unless indicated otherwise.

G. At interior slabs do not over trowel where concrete is to be left exposed to avoid slippery surfaces when wet. Review finishing with Architect's representative prior to completing the work.

3.8 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than 7 days by saturated burlap unless noted otherwise.

   a. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

2. Final Curing: Begin after initial curing but before surface is dry.

3. Where damp curing is not feasible due to location, and with written permission of SER, spray with an approved curing compound. In general, curing compound is not an acceptable substitute for damp curing.

3.9 MASS CONCRETE

A. Unless otherwise noted, any concrete member with least dimension greater than 29 inches is defined as Mass Concrete. Smaller elements utilizing high strength concrete may be identified as Mass Concrete in the drawings or specification.

B. Mass Concrete is subject to the following temperature limitations:

1. Maximum internal temperature is 150 degrees Fahrenheit.

2. Maximum differential (gradient) between internal (core) and nearby surface temperatures is 35 degrees Fahrenheit. Maximum differential between core and surface temperatures more than 20 feet apart is 40 degrees Fahrenheit.

C. Contractor shall submit a Thermal Control and Placement Plan containing:

1. Calculations of maximum internal temperature and maximum gradient, based on the approved mix design or designs.

2. Required concrete temperature at time of placement (Maximum Placement Temperature).

3. Estimated set time and finishing plan.

4. Number and approximate location of temperature sensors, and measurement interval.

5. Intended blanketing, with assumed likely range of external temperatures during and after placement. Note that blankets may be required in warm weather to control temperature gradient.

6. Likely length of time that blankets are required to minimize gradient.

7. If necessary, Plan shall also include cooling through internal piping.

8. Through-thickness construction joints.

9. Placement methodology (bucketing, pumps, conveyors, etc.) and intended placement rate.

10. Placement intent for slabs (full thickness, or layers).

D. On slabs, recheck surface elevations for changes due to subsidence or sloughing after initial screeding.

E. Typical wet curing requirements apply to Mass Concrete, but blanket requirements in other sections are superseded by requirement C.5 above. Blankets are required in warm weather to reduce thermal gradient. Maintain blankets until core and surface temperatures are and are expected to remain within 40 degrees of one another; but blankets need not be maintained for more than two weeks.

F. Typical cold weather temperature requirements apply to Mass Concrete unless superseded by the approved Thermal Control and Placement Plan.

3.10 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to Architect for review prior to commencement of concrete operations.

D. For testing requirements refer to structural notes on the drawings and, where applicable, as indicated below.

E. Refer to Section 01 3510 - Structural Testing and Special Inspection Requirements for testing requirements.

3.11 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

1. Concrete damaged by the construction activities required to complete the Work of this section shall also be considered defective concrete.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

Section 04 05 11 - Masonry Mortaring and Grouting

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.2 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of mortar and grout.

1.3 REFERENCE STANDARDS

A. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

B. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

C. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

D. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.7 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

A. Use only factory premixed packaged dry materials for mortar and grout, with addition of water only at project site.

B. Mortar Mix Designs: ASTM C270, Property Specification.

C. Grout Mix Designs:

1. Bond Beams and Lintels: 2000 psi strength at 28 days; 8-11 inches slump; mix according to ASTM C476.

2.2 MATERIALS

A. Preblended and prepackaged Dry Mortar and Grout: ASTM C 270, Type Indicated.

1. Masonry below grade and in contact with earth: Type M.

2. Masonry above grade: Type S.

3. Product: Provide packaged dry pre-blended mortar and grout products by Spec Mix or approved equivalent.

4. Color: Natural gray except as follows:

a. Exposed locations in finished areas, interior and exterior, as selected by the Architect from the manufactures full range of color where not otherwise indicated.

B. Water: Clean and potable.

C. Bonding Agent: Latex type.

2.3 **MORTAR MIXING**

A. Thoroughly mix mortar ingredients using mechanical batch mixer, according to ASTM C270 and in quantities needed for immediate use.

B. Do not use anti-freeze compounds to lower the freezing point of mortar.

C. If water is lost by evaporation, re-temper only within two hours of mixing.

D. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.4 GROUT MIXING

A. Mix grout according to ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use according to ASTM C476 for fine and coarse grout.

PART 3 EXECUTION

3.1 PREPARATION

A. Apply bonding agent to existing cementitious surfaces.

B. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.2 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.3 GROUTING

A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.

B. Low-Lift Grouting:

1. Limit height of pours to 4 feet 8 inches.

2. Limit height of masonry to 16 inches above each pour.

3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.

4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

C. High-Lift Grouting:

1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.

2. Hollow Masonry: Limit lifts to maximum 4 feet 8 inches and pours to maximum height of 8 feet.

3. Place grout for spanning elements in single, continuous pour.

4. Provide cleanout openings at base of grout lift in cores containing dowels or vertical reinforcement, and in walls to be grouted solid at a maximum of 32 inches on center horizontal when the grout pour is greater than 5 feet 4 inches. Remove mortar droppings through cleanouts and verify placement and location of vertical reinforcement. Form over openings before placing grout.

END OF SECTION

Section 04 20 00 - Unit Masonry

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Reinforcement and anchorage.

D. Flashings.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 04 05 11 - Masonry Mortaring and Grouting.

B. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

C. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

D. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

C. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.

D. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.

E. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.

F. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.

G. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.

H. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

I. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

J. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

K. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.

L. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

M. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, masonry accessories, and flashing and related components.

C. Joint Plans: Provide layout plans and elevations showing control and expansion joint locations.

D. Samples: Submit four samples of decorative block and facing brick units to illustrate color, texture, and extremes of color range.

E. Samples: Submit one sample of each accessory related to masonry and grout.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.6 MOCK-UPS

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

C. Mock-up may remain as part of work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means of that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.

2. Special Shapes: Provide nonstandard blocks configured for lintels and other detailed conditions.

3. Load-Bearing Units: ASTM C90, normal weight.

a. Hollow block.

4. Nonloadbearing Units: ASTM C129.

a. Hollow block.

5. Standard Face Units: Manufacturer's standard color and texture unless noted otherwise; suitable for specified finish where applicable.

2.2 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.

1. Color and texture: As scheduled on the drawings.

2. Nominal size: As scheduled on the drawings.

3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

4. Compressive strength: As indicated on drawings, measured according to ASTM C67/C67M.

2.3 MORTAR AND GROUT MATERIALS

A. Mortar and Grout: As specified in Section 04 05 11.

2.4 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:

1. Blok-Lok Limited: www.blok-lok.com/#sle.

2. Hohmann & Barnard, Inc: www.h-b.com/#sle.

3. TruFast Walls, a division of Altenloh, Brinck & Co. US, Inc : www.trufastwalls.com/#sle.

4. Heckmann Building Products, Inc: www.heckmannbuildingprods.com.

5. WIRE-BOND: www.wirebond.com/#sle.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.

C. Thermal Clips and Wall Ties/Pintles: Refer to Section 07 21 00 - Thermal Insulation for masonry veneer anchor type. All neccessary ties, pintles, and additional fasteners for unit masonry installation shall be provided under Section 04 20 00 - Unity Masonry. Only the fasteners for installation of the foam board installation will be provided by Section 07 21 00 - Thermal Insulation in addition to a percentage of extra fasteners indicated.

2.5 FLASHINGS

A. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

1. Termination Bar: Stainless steel termination Bars, 1 inch wide, 0.075 inch thick, 8 feet long with holes at 8 inch on center.

B. Flashing Sealant/Adhesive: Polyurethane type as specified in Section 07 92 00.

2.6 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

1. Manufacturers:

a. Blok-Lok Limited: www.blok-lok.com/#sle.

b. Hohmann & Barnard, Inc: www.h-b.com/sle.

c. WIRE-BOND: www.wirebond.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

a. Manufacturers:

(1) Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.

(2) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.

(3) York Manufacturing, Inc: www.yorkmfg.com/#sle.

(4) Substitutions: See Section 01 60 00 - Product Requirements.

C. Cavity Vents:

1. Type: Extruded propylene with honeycomb design.

2. Color(s): As selected by Architect from manufacturer's full range.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave.

D. Brick Units:

1. Bond: Running.

2. Coursing: Three units and three mortar joints to equal 8 inches.

3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Isolate masonry partitions from vertical structural framing members with a control joint.

3.6 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels, near top of walls, and at bottom of walls.

1. Exception: It is not necessary to install vents above Multicomponent Cavity Wall Drainage System.

3.7 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Place masonry joint reinforcement as indicated on the drawings.

3.9 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 8 inches, minimum, to form watertight pan at non-masonry construction.

2. Remove or cover protrusions or sharp edges that could puncture flashings.

3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down 1/4 inch to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.

C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 LINTELS

A. Install loose steel lintels over openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.

1. Openings to 42 inches: Place two, No. 4 reinforcing bars 1 inch from bottom web.

2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.

3. Openings over 48 inches: Reinforce openings as detailed.

4. Do not splice reinforcing bars.

5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

6. Place and consolidate grout fill without displacing reinforcing.

7. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 8 inch bearing on each side of opening.

3.11 GROUTED COMPONENTS

A. Lap splices minimum 48 bar diameters, unless specified otherwise on the drawings.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

D. At bearing locations, fill masonry cores with grout for a minimum 8 inches either side of opening.

3.12 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 as follow:

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. Locate joints as indicated on drawings.

a. If no joints are indicated, contractor shall provide for, at a minimum, joints as recommended in the referenced document. Refer to joint plan submittals for final location approval.

3. Space joints at no more than twice the height of the wall, but no more than 40’ o.c.

4. Refer to *Tek Note 10-02DControl Joints for Concrete Masonry Walls – Empirical Method* by the National Concrete Masonry Association (NCMA).

5. Final location of joints subject to approval by the Architect/Engineer.

C. Form expansion/control joints in brick made from clay as follows:

1. Build in compressible joint fillers where indicated.

2. Locate joints as indicated on drawings.

a. If no joints are indicated, contractor shall provide for, at a minimum, joints as recommended in the referenced document. Refer to joint plan submittals for final location approval.

3. Space joints at no more than twice the height of the wall, but no more than 25’ o.c.

4. Refer to *Technical Notes on Brick Construction 18AAccommodation Expansion of Brickwork* by The Brick Industry Association (BIA).

5. Final location of joints subject to approval by the Architect/Engineer.

D. Do not continue horizontal joint reinforcement through control or expansion joints.

E. Install preformed control joint device in continuous lengths. Seal butt and corner joints according to manufacturer's instructions.

F. Size control joint according to Section 07 9200 for sealant performance.

G. Form expansion joint as detailed on drawings.

3.13 BUILT-IN WORK

A. As work progresses, install built-in items shown on the drawings and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

1. Fill adjacent masonry cores with grout minimum 8 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.14 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry according to ASTM C140/C140M for compliance with requirements of this specification.

C. Mortar Tests: Test each type of mortar according to ASTM C780, testing with same frequency as masonry samples.

3.17 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

1. Soiled surfaces shall include all surfaces left exposed to view.

D. Use non-metallic tools in cleaning operations.

3.18 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

Section 04 72 00 - Cast Stone Masonry

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Architectural cast stone.

B. Units required are:

1. Exterior wall units, including sills and water tables.

2. Other items indicated on drawings.

1.2 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.

B. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.3 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2019.

E. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2019, with Editorial Revision (2020).

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

J. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

K. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

L. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2023.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

C. Product Data: Test results of cast stone components made previously by the manufacturer.

1. Include one copy of ASTM C1364 for Architect's use.

D. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

E. Mortar Color Selection Samples.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A firm with a minimum of 5 years experience producing cast stone of types required for project.

2. Current producer member of the Cast Stone Institute or the Architectural Precast Association.

3. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials according to manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Architectural Cast Stone:

1. Any current producer member of the Cast Stone Institute.

2.2 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.

1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.

2. Freeze-Thaw Resistance: Demonstrated by field experience.

3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.

4. Color: Selected by Architect from manufacturer's full range.

5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.

1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.

2. Unless otherwise indicated on drawings, provide:

a. Wash or slope of 1:12 on exterior horizontal surfaces.

b. Drips on projecting components, wherever possible.

c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

1. Pieces More than 12 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.3 MATERIALS

A. Portland Cement: ASTM C150/C150M.

1. For Units: Type I or II, white or gray to match color selected by Architect.

2. For Mortar: Type I or II, except Type III may be used in cold weather.

B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.

1. Galvanized according to ASTM A767/A767M, Class I.

H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.

K. Mortar: Portland cement-lime, ASTM C 270 Type N ; do not use masonry cement.

L. Thermal Clips and Wall Ties/Pintles: Refer to Section 07 21 00 - Thermal Insulation for masonry veneer anchor type. All neccessary ties, pintles, and additional fasteners for cast stone masonry installation shall be provided under Section 04 72 00 - Cast Stone Masonry. Only the fasteners for installation of the foam board installation will be provided by Section 07 21 00 - Thermal Insulation in addition to a percentage of extra fasteners indicated.

M. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:

1. Drench cast stone components with clear, running water immediately before installation.

2. Set units in a full bed of mortar unless otherwise indicated.

3. Fill vertical joints with mortar.

4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.3 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.

1. Rake mortar joints 3/4 inch for pointing.

2. Remove excess mortar from face of stone before pointing joints.

3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.

4. Leave the following joints open for sealant:

a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.

b. Joints in projecting units.

c. Joints between rigidly anchored units, including soffits, panels, and column covers.

d. Joints below lugged sills and stair treads.

e. Joints below ledge and relieving angles.

f. Joints labeled "expansion joint".

B. Installation Tolerances:

1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.

2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.

3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16-inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 REPAIR

A. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.

1. Repair with matching touchup material provided by the manufacturer and according to manufacturer's instructions.

2. Repair methods and results subject to Architect 's approval.

3.5 CLEANING

A. Clean completed exposed cast stone after mortar is thoroughly set and cured.

1. Wet surfaces with water before applying cleaner.
2. Apply cleaner to cast stone according to manufacturer's instructions.
3. Remove cleaner promptly by rinsing thoroughly with clear water.
4. Do not use acidic cleaners.

3.6 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

Section 05 31 00 - Steel Decking

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof deck.

1.2 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold Formed Metal Framing: Support framing for openings larger than 18 inches [<>].

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

C. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

D. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

1.5 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located; include engineer's stamp for connections.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Deck:

1. Canam Steel Corporation: www.canam-steeljoists.ws.
2. New Millennium Building Systems: www.newmill.com/#sle.
3. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 STEEL DECK

A. All Deck Types: Select and design metal deck according to SDI Design Manual.

1. Calculate to structural working stress design and structural properties specified.
2. Maximum Vertical Deflection of Roof Deck: 1/240 of span.

B. Roof Deck: Non-composite type, fluted steel sheet:

1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G60/Z180 galvanized coating.
2. Minimum Base Metal Thickness: As indicated on the drawings.
3. Nominal Height: As indicated on the drawings.
4. Profile: As indicated on the drawings.
5. Formed Sheet Width: 36 inch.
6. Side Joints: Lapped, mechanically fastened.
7. End Joints: Lapped, mechanically fastened.

2.3 ACCESSORY MATERIALS

A. Fasteners: Galvanized hardened steel, self tapping.

B. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

1. Color: Manufacturer's Standard.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

2.4 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

A. Erect metal deck according to SDI Design Manual and manufacturer's instructions. Align and level.

B. On steel supports provide minimum 1-1/2 inch bearing.

C. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum (unless where indicated on the drawings), parallel with the deck flute and at each transverse flute using methods specified.

D. At mechanically fastened male/female side laps fasten at 24 inches on center maximum.

E. At deck openings, provide cold-formed metal framing standard C-shaped steel sections, of web depth, minimum base-steel thickness, flange width and section properties required to meet design requirements. Place cold-formed metal framing perpendicular to flutes; extend minimum two flutes beyond each side of opening and mechanicaly fasten to deck at each flute.

END OF SECTION

Section 05 40 00 - Cold-Formed Metal Framing

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed steel joist framing and bridging.

1.2 RELATED REQUIREMENTS

A. Section 05 44 00 - Cold-Formed Metal Trusses.

B. Section 06 10 00 - Rough Carpentry: Wood blocking and miscellaneous framing.

1.3 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: For lateral-force resisting systems, provide product data sheets on hold-down, showing compliance with requirements.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.

1.5 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Structural Framing:

1. ClarkDietrich: www.clarkdietrich.com/#sle.
2. MarinoWARE: www.marinoware.com/#sle.
3. Phillips Manufacturing Company: www.phillipsmfg.com.
4. The Steel Network, Inc: www.SteelNetwork.com/#sle.
5. Custom Stud, Inc: www.customstud.com.

6. Telling Industries: www.tellingindustries.com.

7. Super Stud Building Products, Inc: www.buysuperstud.com/#sle.

8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Connectors:

1. Same manufacturer as metal framing.

2. Simpson Strong-Tie: www.strongtie.com/#sle.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Design cold-formed framing systems, components and connectors to withstand specified design loads in compliance with ICC (IBC), ASCE 7, AISI S100, and AISI S240.

2.3 MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.

1. Corrosion Protection Coating Designation: CP 60 according to AISI S240.

2.4 STRUCTURAL FRAMING COMPONENTS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

1. Corrosion Protection Coating Designation: CP 60 according to AISI S240.

2.5 MISCELLANEOUS CONNECTIONS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Tapcon or equivalent type fasteners.

2.6 SHEATHING

A. Glass-mat-faced gypsum board; ASTM C1177/C1177M, square long edges, 5/8 inch thick, Type X - fire-resistant.

1. Application: Exterior sheathing, unless otherwise indicated. Sizes to minimize joints in place; ends square cut.

2. Products:

a. CertainTeed Corporation; GlasRoc Brand.

b. Georgia-Pacific Gypsum LLC; DensGlass Sheathing.

c. National Gypsum Company; Gold Bond Brand e2XP Extended Exposure Sheathing.

d. USG Corporation; Securock Glass-Mat Sheathing.

e. Substitutions: See Section 01 6000 - Product Requirements.

2.7 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION - GENERAL

A. Install structural members and connections in compliance with AISI S240.

3.3 INSTALLATION OF STUDS

A. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

B. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.

C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

D. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.

E. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

F. Install intermediate studs above and below openings to align with wall stud spacing.

G. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.

H. Attach cross studs to studs for attachment of fixtures anchored to walls.

I. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

3.4 INSTALLATION OF JOISTS

A. Install framing components according to manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Locate joist end bearing directly over load-bearing studs or provide load distribution on top of stud track.

D. Provide web stiffeners at reaction points.

E. Touch-up field welds and damaged galvanized surfaces with primer.

3.5 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.

3.6 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/4 inch.

END OF SECTION

Section 05 44 00 - Cold-Formed Metal Trusses

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Light gage cold-formed steel roof trusses.

B. Anchorages, bracing, blocking, and bridging.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Roof sheathing.

1.3 REFERENCE STANDARDS

A. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

B. CFSEI 5000 - Field Installation Guide for Cold-Formed Steel Roof Trusses; May 2000.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Span charts.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings:

1. Show member type, location, spacing, size and gage, methods of attachment, and erection details. Indicate supplemental bracing, strapping, splices, bridging, and accessories.

2. Include truss design drawings, signed and sealed by a qualified professional engineer registered in the State in which the Project is located, verifying ability of each truss design to meet applicable code and design requirements.

a. Include the following:

(1) Design criteria.

(2) Details of connections at truss joints.

(3) Bracing requirements.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Steel truss fabricator with minimum 10 years of experience designing and fabricating truss systems equivalent to those required for this project and licensed by an acceptable manufacturer.

C. Installer Qualifications: Experienced installer approved by truss system fabricator.

D. Welders: Qualify welding processes and welding operators according to AWS B2.1/B2.1M.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver trusses and other materials in manufacturer’s unopened bundles or containers, each marked with manufacturer’s name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.

B. Store trusses on blocking, pallets, platforms, or other supports, off the ground and in an upright position, sufficiently braced to avoid damage from excessive bending. Gently slope stored trusses to avoid accumulation of water on interior of truss chord members.

C. Protect trusses and accessories from contact with earth, corrosion, deformation, mechanical damage, or other deterioration when stored at project site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cold-Formed Steel Trusses:

1. Aegis Metal Framing, a Division of MiTek Industries: www.aegismetalframing.com.
2. TrusSteel Division of Alpine Engineered Products, Inc: www.trussteel.com.
3. Cascade MFG Co: www.cascade-mfg-co.com.
4. Wall-tech: www.walltechinc.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Design: Calculate structural characteristics of cold-formed steel truss members according to AISI S100-12.

1. Design Loads: In accordance with applicable codes.

C. Trusses: Light gage steel assemblies providing a complete horizontal framing system for locations indicated, ready for deck installation.

1. Chord and Web Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 40,000 psi; minimum G60/Z180 coating; gages as required for load conditions; all edges rolled or closed.

D. Bracing, Bridging, and Blocking Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 33,000 psi; minimum G60/Z180 coating; gages as required for load conditions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install cold-formed steel trusses in strict accordance with manufacturer's instructions and approved shop drawings, using approved fastening methods.

B. Install temporary erection bracing and permanent bracing and bridging before application of any loads. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at spacing indicated. Anchor trusses securely at bearing points.

C. Adequately distribute applied loads to avoid exceeding the carrying capacity of any one joint, truss, or other component.

D. Exercise care to avoid damaging truss members during lifting and erection and to minimize horizontal bending of trusses.

E. Removal, cutting, or alteration of any truss chord, web, or bracing member in the field is prohibited, unless approved in advance by Architect or the engineer of record and the truss manufacturer.

F. Repair or replace damaged members and complete trusses as directed and approved in writing by Architect or the engineer of record and the truss manufacturer.

G. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

3.2 TOLERANCES

A. Install trusses to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

B. Space individual trusses not more than plus or minus 1/8 inch from plan location. Cumulative error in placement may not exceed minimum fastening requirements of sheathing or other material fastened to trusses.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing according to Section 01 40 00 - Quality Requirements.

3.4 PROTECTION

A. Protect trusses from damage by subsequent construction activities.

B. Repair or replace damaged trusses, truss members, and bracing members; obtain approval in advance by Architect or the engineer of record and the truss manufacturer for all cutting, repairs, and replacements.

END OF SECTION

Section 05 50 00 - Metal Fabrications

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated steel items.

1.2 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Paint finish.

B. Section 09 91 23 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

F. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

I. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all finishing products, including VOC content.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Indicate unit identification mark and location for each unique item.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel W Shapes and Tees: ASTM A992/A992M.

B. Steel Sections, Angles, and Plates: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

D. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

1. Color: Manufacturer's Standard.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Mark each item with its identification mark. Use a non-permanent method at units that will remain exposed; welding is not acceptable, it shall be ground smooth, filled, and primed by the supplier at no additional cost to the Owner.

C. Fabricate items with joints tightly fitted and secured.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish, unless otherwise indicated on the drawings.

B. Lintels: As detailed; prime paint finish, unless otherwise indicated on the drawings.

C. Other items indicated on the drawings.

2.4 FINISHES - STEEL

A. Prime paint steel items.

B. Prepare surfaces to be primed according to SSPC-SP2 minimum.

1. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

2. Prime Painting: One coat.

a. Provide primer products indicated for surfaces to be primed and painted, Refer to Section 09 9113 - Exterior Painting and Section 09 9123 - Interior Painting.

2.5 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

2.6 CONCRETE ANCHORING SYSTEMS

A. Approved Manufacturers/Products:

1. HILTI: www.us.hilti.com.

2. MiTek: www.mitek-us.com.

3. DeWALT: www.anchors.dewalt.com.

4. Red Head: www.itwredhead.com.

5. Simpson Strong-Tie: www.strongtie.com.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding according to AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

Section 06 10 00 - Rough Carpentry

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Roof-mounted curbs.

C. Roofing nailers.

D. Preservative treated wood materials.

E. Fire retardant treated wood materials.

F. Miscellaneous framing and sheathing.

G. Concealed wood blocking, nailers, and supports.

H. Sheathing with factory laminated rigid insulation board.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

D. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

F. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2018, with Errata (2019).

G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

H. PS 1 - Structural Plywood; 2023.

I. PS 2 - Performance Standard for Wood Structural Panels; 2018.

J. PS 20 - American Softwood Lumber Standard; 2021.

K. WWPA G-5 - Western Lumber Grading Rules; 2021.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on insulated sheathing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.

2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

1. Plates: MC15 or KD15.

D. Stud Framing (2 by 2 through 2 by 6):

1. Species: Douglas Fir-Larch.

2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):

1. Species and Grades: As indicated on drawings for various locations.

2.3 LAMINATED LUMBER (STRUCTURAL COMPOSITE LUMBER)

A. LSL materials: Laminated Strand Lumber constructed of strands of wood species or species combinations coated with an exterior-type adhesive and in according to ICC EC ESR-1387. Provide products by TrusJoist or equivalent.

1. E = 1,300,000 PSI

2. FB = 1,700 PSI

3. FV = 400 PSI

2.4 CONSTRUCTION PANELS

A. Roof Sheathing: PS 2 type, rated Structural I Sheathing.

1. Bond Classification: Exposure 1.

2. Span Rating: 24.

3. Performance Category: 5/8 PERF CAT.

B. Roof Sheathing: Oriented strand board structural wood panel, PS 2, with factory laminated roofing underlayment layer.

1. Sheathing Panel: Basis of Design: ThermaCal Non-Ventilated Roof Insulation Panels.

a. Grade: Structural 1 Sheathing.

b. Size: 4 feet wide by 8 feet long.

c. Performance Category: 5/8 PERF CAT.

d. Span Rating: 40/20.

e. Edge Profile: Tongue and groove.

f. Overall Panel Thickness: 6.5 inches.

2. Exposure Time: Sheathing undamaged and integral roofing underlayment layer intact after exposure to weather for up to 180 days.

3. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center.

4. Seam Tape: Manufacturer's standard pressure-sensitive, self-adhering, cold-applied seam tape consisting of polyolefin film with acrylic adhesive.

5. Products:

a. Other Approved Nailbase Type Insulation Panel Manufactueres Listed Below.

b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Wall Sheathing: PS 2 type.

1. Bond Classification: Exposure 1.

2. Grade: Structural I Sheathing.

3. Span Rating: 24.

4. Performance Category: 1/2 PERF CAT.

5. Edge Profile: Square edge.

D. Wall Sheathing: Gypsum, complying with requirements of ASTM C1396/C1396M for gypsum sheathing, square long edges, 5/8 inch Type X fire resistant.

E. Other Approved Nailbase Type Insulation Panels:

1. Hunter Panels: www.hunterpanels.com.

2. ThermaCal Wall Exterior Wall Insulation Panels by GAF: www.cornellcorporation.com.

3. R2+ Base Commercial Grade Insulating Nail Base by Carlisle: www.carlisleccw.com.

4. ACF Foam Nail Base: roof.atlasrwi.com.

5. Substitutions: See Section 01 6000-Product Requirements.

F. Other Applications:

1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.

2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.

3. Other Locations: PS 1, C-D Plugged or better.

2.5 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

2. Products:

a. Simpson.

b. USP.

c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Dissimilar Material Separation Products:

1. Separate Treated Lumber from other metal products and flashings with Self-Adhering Flashing as follows:

a. Provide Grace Vycor Plus or approved equal rubberized asphalt. Install according to manufacturers Instructions. Provide accessories for a complete installation.

D. Self-Adhering Membrane: Provide Grace Ice & Water Shield or approved equal rubberized asphalt. Install according to manufacturers Instructions. Provide accessories for a complete installation.

2.6 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment according to AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested according to ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed according to ASTM D2898.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Do not use treated wood in direct contact with the ground.

2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested according to ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Treat rough carpentry items as indicated .

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.

a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.

a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

D. All wood exposed to or in contact with masonry or concrete shall be Preservative Treated Wood.

E. All wood within 12 inches of weather exposed masonry or concrete shall be separated with a dissimilar material separation products where a fluid applied or sheet product is not already specified or detailed.

F. All wood exposed to or in contact with masonry or concrete shall be Preservative Treated Wood unless wood; wood associated with roofing installation shall be non-treated except where in contact with masonry or concrete located within 12 inches of weather exposed masonry or concrete; an alternate to using treated blocking at these locations is to separate blocking from masonry or concrete with the use of a dissimilar material Separation Products.

G. Install dissimilar material separation products between all preservative treated lumber and metals and flashings.

H. Securely install blocking, size within 1/16 of required dimension, and install plumb and level.

3.2 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. At long edges use sheathing clips where joints occur between roof framing members.

2. Nail panels to framing; staples are not permitted.

B. Insulated Roof Sheathing: Install according to manufacturers instructions.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.

3.4 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.5 CLEANING

A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

Section 06 17 53 - Shop-Fabricated Wood Trusses

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop-fabricated wood trusses.

B. Truss bridging.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

B. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.3 REFERENCE STANDARDS

A. ANSI/TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. SBCA (BCSI) - Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses; 2018 (Updated 2020).

D. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.

1. Include identification of engineering software used for design.

2. Provide shop drawings stamped or sealed by design engineer.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle trusses according to SBCA (BCSI).

B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Truss Plate Connectors:

1. Alpine, an ITW Company: www.alpineitw.com.

2. MiTek Industries, Inc: www.mii.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 TRUSSES

A. Wood Trusses: Design and fabricate trusses according to ANSI/TPI 1 and to achieve specified design requirements indicated.

1. Design Floor Live and Dead Load: Deflection limited to 1/360. See drawings for loading.

2. Design Roof Live and Dead Load: Deflection limited to 1/240. See drawings for loading.

2.3 MATERIALS

A. Lumber:

1. Species: SPF or better.

2. Grade: RIS (GR), Grade Min. No. 2.

3. Moisture Content: Between 7 and 9 percent.

4. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.4 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, Spruce/Pine/Fir, construction grade, 19 percent maximum and 7 percent minimum moisture content.

B. Fasteners: Hot-dip galvanized steel, type to suit application.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions. Simpson, USP, or approved equivalent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that supports and openings are ready to receive trusses.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 ERECTION

A. Install trusses according to manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field-cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between trusses with lumber according to Section 06 10 00.

H. Coordinate placement of decking with work of this section.

I. After erection, touch-up galvanized surfaces with zinc primer.

3.4 TOLERANCES

A. Framing Members: 1/4 inch maximum, from true position.

END OF SECTION

Section 06 41 00 - Architectural Wood Casework

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

C. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 09 21 16 - Gypsum Board Assemblies: Prefabricated Wood Blocking System.

C. Section 12 36 00 - Countertops.

1.3 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. PS 1 - Structural Plywood; 2023.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.

2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

C. Product Data: Provide data for hardware accessories.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, texture, and patterns.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.7 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Standard: Custom Grade, according to AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.2 WOOD-BASED COMPONENTS

A. Hardwood Lumber: NHLA; Graded according to, Grade II/Custom; average moisture content of 5-10 percent; species as follows:

2.3 PANEL MATERIALS

A. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, composed of wood chips bonded with interior grade adhesive under heat and pressure; sanded faces; thickness as required; use for concealed components.

B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with interior grade adhesive to suit application; sanded faces; thickness as required.

1. Use as backing for plastic laminate unless otherwise indicated.

C. Plywood for Non-Decorative Purposes: NIST PS 1, Interior rated adhesives, core of wood plies from listed species unless otherwise indicated, thickness as indicated or as required by application.

D. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.

2.4 LAMINATE MATERIALS

A. Manufacturers:

1. Arborite: www.arborite.com/#sle.
2. Formica Corporation: www.formica.com/#sle.
3. Lamin-Art, Inc: www.laminart.com.
4. Panolam Industries International, Inc: www.panolam.com/#sle.
5. Wilsonart LLC: www.wilsonart.com/#sle.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as indicated.

1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color and finish as selected by Architect from manufacturers full range of colors.
2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, color and finish as selected by Architect from manufacturers full range of colors.
3. Cabinet Liner: CLS, 0.020 inch nominal thickness, color and finish as selected by Architect from manufacturers full range of colors.

2.5 COUNTERTOPS

A. Countertops: See Section 12 36 00.

2.6 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; with or without self-locking serrated tongue; of width to match component thickness.

1. Color: Match adjacent plastic laminate.

2. Materials Thickness:

a. Door and Drawer Edges: 0.118 inches.

b. Other Edges: 0.018 inches.

3. Use at exposed sheet material edges and perimeter of all doors and drawers.

4. Products:

a. WoodTape by Doellken-Woodtape: www.na.doellken.com.

b. Canplast: www.canplast.com.

c. Rehau: www.rehau.com.

d. PVC Bumper Molding by Patwin Plastics: www.patwin.com.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

F. Grommets: Standard plastic grommets for cut-outs, in color as selected by Architect.

2.7 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Additional Hardware Items: As detailed and noted on the casework sections and elevations.

C. Locking Shelf Supports: Standard side-mounted system using multiple holes for pin supports with locking clips, clear finish, for nominal 1 inch spacing adjustments.

1. Product: 8705CL 1/4" Pin Shelf Lock for 3/4" Shelf, Finish Clear manufactured by www.hardwareresources.com.

D. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.

E. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

F. Drawer Slides:

1. Type: Full extension.

2. Static Load Capacity: 100 lbs minimum.

3. Mounting: Side mounted.

4. Stops: Integral type.

5. Features: Provide soft-close/stay closed type.

6. Manufacturers:

a. Accuride International, Inc; Light-Duty Drawer Slides: www.accuride.com/#sle.

b. Blum, Inc: www.blum.com/#sle.

c. Grass America Inc: www.grassusa.com/#sle.

d. Hettich America, LP: www.hettich.com/sle.

e. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.

f. Substitutions: See Section 01 60 00 - Product Requirements.

G. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

1. Manufacturers:

a. Hardware Resources; 22855-000: www.hardwareresources.com/#sle.

b. Hettich America, LP; Sensys: www.hettich.com/sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2.8 FABRICATION

A. Cabinet Style: Flush overlay.

B. Cabinet Doors and Drawer Fronts: Flush style.

C. Drawer Construction Technique: As specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated.

D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

1. Provide separate base to be installed and leveled prior to cabinet installation.

E. Finished Ends: Finish ends of all casework not hidden by permanent construction; including locations adjacent to appliances and removable lowers cabinets.

F. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

G. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

H. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

I. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.

2.9 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work according to AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

E. Finish work according to AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1500, use systems preferred by manufacturers based usage type, or equivalent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Install work according to AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

1. Set separate base, plumb, level, and secure rigidly in-place prior to setting cabinets.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinets to floor using appropriate angles and anchorages.

G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

Section 07 21 00 - Thermal Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, and over roof deck .

B. Batt insulation and vapor retarder in exterior wall construction.

C. Foundation insulation protection at grade.

1.2 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2023a.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

E. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 °C; 2022.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.4 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.

1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested according to ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested according to ASTM E84.
4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
5. Board Size: 48 x 96 inch.
6. Board Thickness: As indicated on the drawings.
7. Board Edges: Square.
8. Thermal Conductivity (k factor) at 75 degrees F: 0.18.
9. Compressive Resistance: 25 psi.

10. Installation Locations:
    a. Natural Skin Surfaces: All locations unless indicated otherwise.
    b. Cut Cell Surfaces: Locations at grade where parging is indicated.
11. Manufacturers:
    a. DuPont de Nemours, Inc: building.dupont.com/#sle.
    b. Kingspan Insulation LLC: www.kingspan.com/#sle.
    c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
    d. Diversifoam Products: www.diversifoam.com.
12. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rigid Cellular Polyisocyanurate (ISO) Thermal Insulation Board with Facers Both Sides: Complying with ASTM C1289.
1. Classifications:
    a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
        (1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
        (2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
        (3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48), minimum, at 75 degrees F.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested according to ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested according to ASTM E84.
4. Board Size: 48 inch by 96 inch.
5. Board Thickness: As indicated on the drawings.
6. Board Edges: Square.
7. Products:
    a. Atlas Roofing Corporation: www.atlasroofing.com/#sle.
    b. Carlisle Coatings & Waterproofing, Inc: www.carlisleccw.com/sle.
    c. DuPont de Nemours, Inc: building.dupont.com/#sle.
    d. Elevate: www.holcimelevate.com/#sle.
    e. GAF: www.gaf.com/sle.
    f. GenFlex Roofing Systems, LLC: www.genflex.com.
    g. Hunter Panels: www.hunterpanels.com/#sle.
    h. Johns Manville: www.jm.com/sle.
    i. Rmax Inc: www.rmax.com.
    j. Versico, a division of Carlisle Construction Materials Inc: www.versico.com.
8. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.

1. Flame Spread Index: 25 or less, when tested according to ASTM E84.

2. Smoke Developed Index: 450 or less, when tested according to ASTM E84.

3. Combustibility: Non-combustible, when tested according to ASTM E136, except for facing, if any.

4. Formaldehyde Content: Zero.

5. Facing: Unfaced.

6. Products:

a. CertainTeed Corporation: www.certainteed.com/#sle.

b. Johns Manville: www.jm.com/#sle.

c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.

1. Smoke Developed Index: 450 or less, when tested according to ASTM E84.

2. Products:

a. Johns Manville: www.jm.com/#sle.

b. Knauf Insulation: www.knaufinsulation.com/#sle.

c. ROCKWOOL: www.rockwool.com/#sle.

d. Thermafiber, Inc: www.thermafiber.com/#sle.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 FOUNDATION INSULATION PROTECTION AT GRADE

A. Product: GroundBreaker by NUDO; a fiberglass reinforced plastic (FRP) barrier that provides complete protection for insulation or approved equivalent.

1. Color: Gray.

2. Accessories: Provide all accessories for a complete system.

2.4 ACCESSORIES

A. Sheet Vapor Retarder: Clear polyethylene film for above grade application, 6 mil thick.

B. Tape: Polyethylene self-adhering type, 2 inch wide.

C. Board Insulation Fasteners: Preassembled fastener units consisting of sealing washer, screw, and gasketing tube.

1. Basis of Design: Thermal Concrete 2-Seal Wing nut Anchor, adjustable Thermal Veneer Anchor.

2. Length as required for thickness of insulation material, penetration of support structure, and accomodating of masonry veneer anchor.

3. Thread and tip types as required for substrate material.

4. Materials: Stainless steel Type 304.

5. Hook Wall Ties/Pintles by masonry supplier/installer, hot-dip galvanized; coordinate with other trades and project coordinator.

6. Provide additional veneer anchor fastener to masonry contractor. Supply a minimum of 10 percent additional fasteners for masonry veneer attachment.

7. Supplemental non-masonry veneer anchors shall be acceptable to board manufacturer. Supply and install additional fasteners, in addition to masonry veneer type fasteners, where fastener spacing required by board manufacturer is closer than the indicated masonry veneer anchor spacing.

8. Other Approved Products:

a. Hohmann & Barnard, Inc: www.h-b.com.

b. Heckmann Building Products, Inc.

c. Blok-Lok Limited: www.blok-lok.com.

d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:

1. By methods approved by board and adhesive manufacturers.

B. Install boards horizontally on foundation perimeter.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at following frequency:

1. Spacing indicated for masonry ties and as required by board manufacturer.

B. Install boards to fit snugly.

1. Place membrane surface facing out, and install foam board manufacturer's recommended expanding foam product at all board joints.

a. Remove excess expanding foam from intended air space behind brick.

C. Install boards horizontally on walls.

1. Install in running bond pattern.

2. Butt edges and ends tightly to adjacent boards and protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 BATT INSTALLATION

A. Install insulation and vapor retarder according to manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over face of member.

F. Tape seal tears or cuts in vapor retarder.

G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

3.5 FOUNDATION INSULATION PROTECTION AT GRADE

A. Install foundation insulation protection according to manufacturer's instructions.

3.6 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

Section 07 21 19 - Foamed-In-Place Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foamed-in-place insulation.

1.2 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, insulation properties, and preparation requirements.

C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.

1.5 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

PART 2 PRODUCTS

2.1 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open cell or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested according to ASTM C518.

2. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness according to ASTM E96/E96M, desiccant method.

3. Water Absorption: Less than 2 percent by volume, maximum, when tested according to ASTM D2842.

4. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness according to ASTM E2178 at 1.57 psf.

5. Closed Cell Content: At least 90 percent.

6. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested according to ASTM E84.

7. Products:

   a. BASF Corporation: www.spf.basf.com/#sle.

   b. Carlisle Spray Foam Insulation: www.carlislesfi.com/#sle.

   c. DuPont de Nemours, Inc: building.dupont.com/#sle.

   d. Gaco Western: www.gaco.com/#sle.

   e. Henry Company: www.henry.com/#sle.

   f. Huntsman Building Solutions
   : www.huntsmanbuildingsolutions.com/#sle.

   g. Johns Manville: www.jm.com/#sle.

   h. Rhino Linings Corporation: www.rhinolinings.com/#sle.

   i. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.2 APPLICATION

A. Apply insulation according to manufacturer's instructions.

B. All foam-in-place insulation shall be covered w/ an approved thermal barrier such as 5/8 inch gypsum board, cementitious, or intumescent coating.

3.3 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

Section 07 21 26 - Blown Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceiling, Ceiling, Attic, and Attic: Blown insulation pneumatically placed into joist spaces and joist spaces.

1.2 REFERENCE STANDARDS

A. ASTM C1015 - Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation; 2017.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Blown Insulation:

1. GreenFiber: www.greenfiber.com/#sle.
2. Thermafiber, Inc: www.thermafiber.com/#sle.
3. Fiberlite Technologies, Inc: www.fiberlitetech.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Applications: Provide blown insulation in attic and ceiling as indicated on drawings.

B. Loose Fill Insulation: ASTM C739, cellulose fiber type, bulk for pneumatic placement.

2.3 ACCESSORIES

A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.

1. Material: Polyvinyl chloride (PVC), polystyrene, or similar material.
2. Roof Joist/Truss Spacing: 24 inch on center, nominal.
3. Manufacturers:
    a. Brentwood Industries, Inc; AccuVent
    Original: www.brentwoodindustries.com/#sle.
    b. Durovent or ProVent by ADO Product or equivalent.
    c. Substitutions: Or equivalent.
4. Sheet Vapor Retarder: Clear polyethylene film for above grade application, 6 mil thick.
5. Tape: Polyethylene self-adhering type, 2 inch wide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify spaces are unobstructed to allow for proper placement of insulation.

3.2 INSTALLATION

A. Install insulation and ventilation baffle according to ASTM C1015 and manufacturer's instructions.

B. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.

C. Place insulation pneumatically to completely fill joist and rafter spaces.

D. Place insulation against baffles, and do not impede natural attic ventilation to soffit.

E. Completely fill intended spaces leaving no gaps or voids.

3.3 CLEANING

A. Remove loose insulation residue.

END OF SECTION

Section 07 25 00 - Weather Barriers

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air Barriers: Materials that form a system to stop passage of air through exterior walls.

B. Air and Vapor Barriers: Materials that form a system to stop passage of air and vapor through exterior walls.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics, system components, and system components.

C. Manufacturer's Installation Instructions: Indicate preparation and installation methods.

1.5 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically Fastened:

1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested according to ASTM E2178.

2. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested according to ASTM E84.

3. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.

4. Manufacturers:

a. DuPont Company; Tyvek CommercialWrap: www.dupont.com.

b. Fiberweb, Inc; Typar MetroWrap: www.typar.com/#sle.

c. Fortifiber Building Systems Group; WeatherSmart Commercial: www.fortifiber.com/#sle.

d. VaproShield, LLC; WrapShield: www.vaproshield.com.

e. DOW; Weathermate Plus Housewrap: www.dow.com.

f. Barricade Building Products; Barricade Plus: www.barricadebp.com.

g. Benjamin Obdyke; HydroGap Drainable Housewrap: www.benjaminobdyke.com.

h. Grip Rite; Commercial Grade Weather Barrier: www.grip-rite.com.

i. TamlynWrap; Drainable Housewrap: www.tamlynwrap.com.

j. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Coating: Liquid applied, resilient, UV-resistant coating and associated joint treatment.

1. Water Vapor Permeance: 1.0 perm, maximum, when tested according to ASTM E96/E96M.

2. VOC Content: Less than 50 g per L when tested according to 40 CFR 59, Subpart D (EPA Method 24).

3. Suitable for use on concrete, masonry, plywood and gypsum sheathing.

4. Joint Preparation Treatment: Coating manufacturer's recommended method, either tape or reinforcing mesh saturated with coating material.

5. Manufacturers:

a. BASF Corporation; MasterSeal AWB 660 I: www.master-builders-solutions.basf.us/#sle.

b. Carlisle Coatings and Waterproofing, Inc; Barriseal-R: www.carlisleccw.com/#sle.

c. Epro Services, Inc; ECOFLEX-S: www.eproserv.com/#sle.

d. Henry Company; Air-Bloc 32MR: www.henry.com/#sle.

e. LATICRETE International, Inc.; LATICRETE MVIS Air & Water Barrier with LATICRETE Waterproofing/Anti-Fracture Fabric: www.laticrete.com/#sle.

f. Mar-flex Waterproofing & Building Products; Air & Vapor Barrier 1800: www.mar-flex.com/#sle.

g. Parex USA, Inc.; Parex USA WeatherBlock: www.parexusa.com.

h. W.R. Meadows, Inc; Air-Shield LM or Air-Shield LM (All Season): www.wrmeadows.com/#sle.

i. Tremco; ExoAir 120: www.tremcosealants.com.

j. Polyguard; AirLok Flex: www.polyguard.com.

k. TK Products; TK-AIRMAX 2102/2103: www.henry.com.

B. Joint Filler: As recommended by coating manufacturer and suitable to the substrate.

2.3 ACCESSORIES

A. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

B. Seam Tape: As recommended by the weather barrier manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

B. Verify that all openings and penetrations are in place and ready for the work of this section. It is the responsibility of the contractor of this section to repair new penetrations at the cost of the contractor who created new penetrations after the work of this section was completed.

3.2 INSTALLATION

A. Install materials according to manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Mechanically Fastened Sheets - On Exterior:

1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer but at least 6 inches.
3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
5. Install air barrier and vapor retarder underneath the jamb flashings.
6. Install head flashings under weather barrier.
7. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

E. Coatings:

1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
2. Use flashing to seal to adjacent construction and to bridge joints.

F. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.3 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

Section 07 41 13 - Metal Roof Panels

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal roof panel system of preformed steel panels.

B. Gutters and downspouts.

C. Attachment system.

D. Finishes.

E. Accessories.

1.2 REFERENCE STANDARDS

A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

B. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.

1. Show work to be field-fabricated or field-assembled.

C. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.

D. Test Reports: Indicate compliance of metal roofing system to specified requirements.

E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.4 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide manufacturer’s special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of twenty year period from date of Substantial Completion.

C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Other Acceptable Manufacturers; Metal Roof Panels:

1. ATAS International, Inc: www.atas.com/#sle.

2. Holcim Elevate; Product UNA-CLAD UC-4: www.holcimelevate.com.

3. Petersen Aluminum Corporation: www.pac-clad.com/#sle.

4. Varco Pruden Buildings: www.vp.com .

5. Berridge: www.berridge.com .

6. Metal Sales Manufacturing Corporation: www.metalsales.us.com .

7. Kingspan: www.kingspanpanles.us .

8. McElroy Metal, Inc.: www.mcelroymetal.com .

9. IMETCO Innovative Metals Company, Inc.: www.imetco.com .

10. Metl-Span LLC: wwww.metlspan.com.

11. MBCI: www.mbci.com.

12. Mac Metals Architectural: www.macmetalarchitectural.com.

2.2 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:

1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested according to ASTM E1592.

2. Overall: Complete weathertight system tested and approved according to ASTM E1592.

3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

4. All loads incurred by the snow retention system will be transferred to the panels; therefore, proper panel attachment to substrate/structure is necessary to prevent roof panels from sliding under snow load.

2.3 METAL ROOF PANELS

A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.

1. Steel Panels:

a. Aluminum-zinc alloy-coated steel complying with ASTM A792/A792M; minimum AZ50 coating.

b. Steel Thickness: Minimum 24 gauge, 0.024 inch.

2. Texture: Pencil Ribbed Smooth Panels.

3. Length: Full length of roof slope, without lapped horizontal joints.

4. Width: Maximum panel coverage of 18 inches.

C. Metal Soffit Panels:

1. Profile: Flush seam, with venting not provided.

2. Steel Thickness: Minimum 24 gage.

3. Color: As selected by the Architect.

2.4 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.5 FABRICATION

A. Panels: Provide factory fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

2.6 FINISHES

A. Fluoropolymer Coating System: Manufacturer’s standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss as scheduled on the drawings.

2.7 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:

1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

D. Self-adhering/adhesive membrane roofing underlayment 2 Layers: Underlayment shall be manufactured by same manufacturer as metal panels when available; Grace Construction Products Ice and water shield HT; Tamko Building Products, Inc. TW Underlayment; Elevate Clad-Gard SA; or approved equivalent with a minimum of 25 years experience in the production and sales of self-adhered membrane roofing underlayments. Underlayment products shall meet the requirements of ASTM D 1970 for self-adhering roofing underlayments.

E. Snow Retention: Fence type snow guard with fully assembled clamp attachment by the manufacturer. Provide at locations indicated on the drawings. Spacing and layout as designed by the snow retention system manufacturer.

F. Provide splash pads or connect downspout with boot where subsurface drains are indicated as follows:

1. Splash Pads: Precast concrete type, 12 inch x 24 inch x 3 inch minimum with raised edges on three sides; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2. Downspout Boots: Steel or plastic; paint boot and pipe to match downspouts unless factory finished to match.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels 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 INSTALLATION

A. Overall: Install roofing system according to approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.

1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.

2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

    a. Field cutting shall be done according to panel manufacturer's recommendations and shall not void panel warranty.

B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Underlayment 2 Layers: Install roofing underlayment per manufacturers instructions before installing preformed metal roof panels. Secure by methods acceptable to metal roof panel manufacturer. Apply from eaves to ridge in shingle fashion, overlapping joints according to manufactures recommendations to meet the requirements of the metal roof panel system.

3.3 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.4 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION

Section 07 46 46 - Wood Composite Siding

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood composite siding.

B. Factory finish.

C. Non-compressible rainscreen mat.

1.2 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Manufacturer's requirements for related materials to be installed by others.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Installation methods, including nail patterns.

C. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

D. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 5 years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.1 SIDING

A. Lap Siding: Individual horizontal composite boards formed under high pressure with integral surface texture.

1. Profile: As indicated on the drawings.

2. Texture: Simulated cedar grain.

3. Length: 16 ft, nominal.

4. Finish: Factory applied topcoat.

5. Color: As indicated on drawings; supply a minimum of one gallon of each color for field painting of cut end, finish cut end in field with materials provided by factor finisher.

6. Warranty: A 5-year, 100% labor and replacement feature and a 50-year prorated, limited warranty on the substrate.

7. Lap Siding Manufacturers:

a. Wausau Siding System; LP Building Products with Diamond Kote Factory Finish: www.wausausupply.com.

b. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ACCESSORIES

A. Trim: Same material and texture as siding.

B. Rainscreen Mat: CavClear Rainscreen Mat Heavy Duty or equivalent by www.cavclear.com.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

D. Joint Sealer: As specified in Section 07 9200; color to match adjacent factory finish.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Do not begin until unacceptable conditions have been corrected.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Install sheet metal flashing:

1. Above door and window trim and casings.

2. Above horizontal trim in field of siding.

B. Install non-compressible rainscreen mat according to manufactures recommendations prior to installing any siding or trim.

3.3 INSTALLATION

A. Install according to manufacturer's instructions and recommendations.

1. Read warranty and comply with all terms necessary to maintain warranty coverage.

2. Use trim details indicated on drawings.

3. Touch up all field cut edges before installing.

4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Sheathing: Fasten siding into sheathing/studs.

1. At 16 inches oc studs fasten panels at 8" oc with 6d (.118" x .267" x 3") nails; between studs fasten panels at 8" oc with Ribbed Wafter-Head No. 8 (.375" x 2 5/8") screws.

C. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

D. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

E. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. paint all exposed cut edges.

END OF SECTION

Section 07 62 00 - Sheet Metal Flashing and Trim

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated on the drawings.

B. Bird Spikes.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.

B. Section 07 41 13 - Metal Roof Panels: Flashings, Gutters, and Downspouts to match metal roofing panels.

C. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.3 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2022.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. CDA A4050 - Copper in Architecture - Handbook; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 8 by 8 inch in size illustrating metal finish color.

1.5 QUALITY ASSURANCE

A. Perform work according to SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

1. Do not use unfinished galvanized steel flashings in finished locations, interior or exterior, unless specifically indicated.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.

1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2. Color: As selected by Architect from manufacturer's full colors.

3. Face Heights: Flashings 8 inch or less shall be a minimum of 24 gauge, over 8 inches shall be 22 gauge, or as indicated on the drawings. Continuously supported flashing over 8 inches may be 24 gauge unless noted otherwise.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabrication of copings to comply with ANSI/SPRI/FM 4435/ES-1.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

2.3 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Sealant: Type specified in Section 07 9200.

D. Bird Spikes: Bird Spikes by NiXalite of America Inc or approved equivalent.

1. Model S Bird Spikes.

2. 4 inch high and 4 inch wide.

3. 120 wire spikes per foot.

4. 100% Stainless Steel.

5. Manufacturers Standard Mounting Hardware.

6. Color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 INSTALLATION

A. Install manufactured products according to manufacturers instructions including all accessory components to create a complete system.

B. Secure flashings in place using concealed fasteners.

C. Apply sealant between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

END OF SECTION

Section 07 92 00 - Joint Sealants

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.2 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

C. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.

2. List of backing materials approved for use with the specific product.

3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.

4. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Executed warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.5 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Base Manufacturer: Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.

B. Other Acceptable Manufacturers:

1. Master Builders Solutions: www.master-builders-solutions.com/en-us.
2. Bostik Inc: www.bostik-us.com.
3. Dow Chemical Company: www.dow.com.
4. Manus Products, Inc.: www.manus.net.
5. Pecora Corporation: www.pecora.com.
6. Red Devil: www.reddevil.com.
7. Sherwin-Williams Company: www.sherwin-williams.com.
8. Sika Corporation: www.usa.sika.com.
9. W.R.Meadows, Inc: www.wrmeadows.com.
10. Hilti: www.hilti.com.
11. Substitutions: See Section 01 6000 - Product Requirements.

2.2 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints and penetrations of pipes, tubes, conduit, ductwork, and structural framing through walls, ceilings, and floors in finished and unfinished spaces.
   d. Joints between different exposed materials.
   e. Openings below ledge angles in masonry.
   f. Exterior Joints shall include those between non-conditioned spaces and conditioned spaces.
   g. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. Joints and penetrations of pipes, tubes, conduit, ductwork, and structural framing through walls, ceilings, and floors in finished and unfinished spaces.
   c. Joints indicated on the drawings.
   d. Interior joints to be sealed shall include those between non-conditioned spaces and conditioned spaces.
   e. Other joints indicated below.

3. Do not seal the following types of joints:

a. Intentional weep holes in masonry.

b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.

c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.

d. Joints where installation of sealant is specified in another section.

e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

1. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.

2. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.

3. Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.

4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; Refer to colors below.

5. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

6. Other Floor Joints: Self-leveling polyurethane traffic-grade sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.3 JOINT SEALANTS - GENERAL

A. Colors: Color shall be selected by the Architect from manufacturer's full range unless specifically indicated to be a specific color.

2.4 NONSAG JOINT SEALANTS

A. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.

1. Products:

a. Tremsil 200 manufactured by Tremco Commercial Sealants.

b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 25 percent, minimum.

2. Color: To be selected by Architect from manufacturer's standard range.

3. Products:

a. Master Builders Solutions; MasterSeal NP1 or NP2: www.master-builders-solutions.com/en-us/#sle.

b. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC or Dymonic FC: www.tremcosealants.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

1. Color: To be selected by Architect from manufacturer's full range.

2. Products:

a. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

2.5 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.

1. Movement Capability: Plus and minus 25 percent, minimum.

2. Color: To be selected by Architect from manufacturer's full range.

3. Products:

a. THC-901, Vulkem 445SSL (also Dymonic FC, or Dymeric 240 FC) manufactured by Tremco Commercial Sealants & Waterproofing.

b. MasterSeal SL 1, SL 2 (also NP 1, or NP 2 manufactured by Master Builders Solutions.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2.6 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.

2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.

3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, according to manufacturer's instructions.

C. Perform preparation according to manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

A. Install this work according to sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION

A. Protect sealants until cured.

END OF SECTION

Section 08 11 13 - Hollow Metal Doors and Frames

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 09 91 23 - Interior Painting: Field painting.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) according to specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Fleming Door Products, an Assa Abloy Group company : www.assaabloydss.com/#sle.
4. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
5. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
6. Steelcraft, an Allegion brand: www.allegion.com/#sle.
7. Technical Glass Products: www.tgpamerica.com/#sle.
8. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Flush.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) according to specified requirements.

8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process according to ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

   a. Based on NAAMM HMMA Custom Guidelines: Provide at least A25/ZF75 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) or G60/Z180 (galvanized) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

   a. Level 3 - Extra Heavy-duty.

   b. Physical Performance Level A, 1,000,000 cycles; according to ANSI/SDI A250.4.

   c. Model 2 - Seamless.

   d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.

   e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.

2. Door Core Material: Polystyrene, 1 lbs/cu feet minimum density.

   a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 according to ASTM E84, and completely enclosed within interior of door.

3. Door Thickness: 1-3/4 inches, nominal.

4. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

   a. Level 2 - Heavy-duty.

   b. Physical Performance Level B, 500,000 cycles; according to ANSI/SDI A250.4.

   c. Model 1 - Full Flush.

   d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.

2. Door Core Material: Polystyrene, 1 lbs/cu feet minimum density.

   a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 according to ASTM E84, and completely enclosed within interior of door.

3. Door Thickness: 1-3/4 inches, nominal.

4. Door Finish: Factory primed and field finished.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door according to applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.

1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) according to ASTM A653/A653M, with A60/ZF180 coating.

2. Frame Metal Thickness: 14 gauge, 0.067 inch, minimum.

3. Frame Finish: Factory primed and field finished.

4. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames, Non-Fire Rated: Face welded type.

1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

2. Frame Finish: Factory primed and field finished.

D. Frames Depth: Size frame depth to accommodate wall assembly thickness and to allow proper attachment to assembly components.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Finish: Paint in field. Color as selected by the Architect.

2.6 ACCESSORIES

A. Glazing: As specified in Section 08 80 00, factory installed.

B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured according to ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

B. Fill frames at exterior doors and doors between heated and unconditioned space with foam-in-place insulation. Product: Great Stuff Pro window and door by Dupont or approved equivalent.

3.3 INSTALLATION

A. Install doors and frames according to manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 08 71 00.

3.4 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

Section 08 36 13 - Sectional Doors

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.2 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

D. NEMA MG 1 - Motors and Generators; 2021.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL (DIR) - Online Certifications Directory; Current Edition.

H. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.

E. Operation Data: Include normal operation, troubleshooting, and adjusting.

F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty for electric operating equipment. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Insulated Steel Sectional Doors - Thermacore 592 Series manufactured by Overhead Door Corporation.

B. Other Acceptable Manufacturers - Sectional Doors:

1. C.H.I. Overhead Doors: www.chiohd.com/#sle.
2. Clopay Building Products: www.clopaydoor.com/sle.
3. Raynor Garage Doors: www.raynor.com/#sle.
4. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com/#sle.
5. Midland Garage Doors: www.midlandgaragedoor.com.
6. Overhead Door Corporation: www.overheaddoor.com.
7. Windsor Republic Doors: www.windsordoor.com.
8. Haas Door: www.haasdoor.com.
9. Upwardor: www.upwardor.com.
10. Liftmaster Commercial Door Operators: www.liftmaster.com.
11. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 STEEL DOORS

A. Steel Doors: Flush steel, insulated; clearance lift (as defined by Overhead Door Corporation) operating style with track and hardware; complying with DASMA 102, Commercial application.

1. Performance (Wind Loads): Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated according to applicable code; section 1609 of the current year of the International Building Code; Design for sustained wind speeds and gusts.
2. Exterior Finish:
    a. Factory finished with acrylic baked enamel; color as selected by Architect.
3. Interior Finish:
    a. Factory finished with acrylic baked enamel; color as selected from manufacturers standard line.
4. Electric Operation: Electric control station.

B. Door Panels: Flush steel construction; outer steel sheet of 0.0156 inch thick, ribbed profile; inner steel sheet of 0.0156 inch thick, flat profile; core reinforcement of 2 inch thick polyurethane core with a minimum R-value of 17.5.

C. Glazing: Manufacturer standard thermal glazing, double thermal acrylic.

2.3 TRACK OPERATING STYLES

A. Operating Styles: As indicated; for other locations follow determination guideline below.

B. Track Style Determination Guideline (Based on Overhead Door Corporation):

1. Low Headroom Track: Provide at doors where clearances are inadequate for proper installation of other track styles. Trolley type operation may be substituted for wall mount.

2. Standard Lift Track: Provide at standard headroom doors where "Lift Clearance" guidelines cannot be met. Trolley type operation may be substituted for wall mount.

3. Clearance Lift Track: Provide at all doors where Headroom allows "Lift Clearance" to be a minimum of 24 inches or higher than "Standard Lift".

4. Full Vertical Track: Provide at all doors where Headroom allows for "Full Vertical" track in lieu of all other track operating styles.

C. Opening Restrictions: When door is fully opened, door shall not reduce building opening size.

2.4 COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch minimum thickness; 3 inch wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Spring cycles: 50,000 minimum.

C. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

D. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

E. Head Weatherstripping: EPDM rubber seal, one piece full length.

F. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

G. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated according to applicable code; section 1609 of the current year of the International Building Code; Design for sustained wind speeds and gusts.

2.5 **MATERIALS**

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, stucco embossed surface.

2.6 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

1. Provide interlock switches on motor operated units.

B. Electric Operators:

1. Mounting: Side mounted on cross head shaft.

2. Basis of Design: Model RSX by Overhead Door.

a. Enclosed gear driven limit switch

b. Enclosed magnetic cross line reversing starter

c. Mounting brackets and hardware; account for construction type and materials.

d. Where applicable provide center mount draw bar assemble at low headroom openings where side mounted on cross head shaft clearances are inadequate for proper installation.

3. Motor Enclosure:

a. Interior Doors: NEMA MG 1, Type 1; open drip proof.

4. 1/2 hp; manually operable in case of power failure, transit speed of 12 inches per second. Increase hp when recommended by door manufacturer for larger doors.

5. Motor Voltage: 120 volts, single phase, 60 Hz.

6. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.

7. Controller Enclosure: NEMA 250, Type 1.

8. Opening Speed: 12 inches per second.

9. Brake: Adjustable friction clutch type, activated by motor controller.

a. Brake system actuated by independent voltage solenoid.

10. Manual override in case of power failure.

11. See Section 26 05 83 for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.

1. 24 volt circuit.

2. Surface mounted, at interior door jamb.

3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.

a. Primary Device: Provide NEMA 1 photo eye sensors as required with momentary-contact control device.

E. Disconnect Switch: Factory mount disconnect switch in control panel.

F. Hand Held Transmitter: Digital control, and resettable.

1. Provide three programmed transmitters for each sectional door.

2. Each transmitter shall have same function as Control Stations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that framing and support members are properly placed and ready to receive the Work of this section. Notify Architect immediately upon discover of conditions that may prevent proper installation which include improper sealing, function, and partial opening of the door.

C. Verify opening dimensions and adjacent construction allow for proper installation of sectional door and operator. Notify Architect immediately upon discover of conditions that may prevent proper installation which include improper sealing, function, and partial opening of the door.

D. Verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.3 INSTALLATION

A. Install door unit assembly according to manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Install weatherstripping, perimeter trim, closures, and other accessories.

3.4 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 feet straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.5 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Adjust door to open fully as to not diminish overall opening size.

3.6 CLEANING

A. Clean doors and frames and glazing (where glazing is applicable).

B. Remove temporary labels and visible markings.

3.7 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

Section 08 43 13 - Aluminum-Framed Storefronts

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.2 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

B. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section according to AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Kawneer; Product 451 (Interior Non-thermal) and 601T (Exterior Thermal) Series: www.kawneer.com.

B. Other Acceptable - Aluminum-Framed Storefronts Manufacturers:

1. Arcadia, Inc: www.arcadiainc.com/#sle.
2. Boyd Aluminum: www.boydaluminum.com/#sle.
3. CMI Architectural Products, Inc: www.cmiarch.com.
4. FreMarq Innovations: www.fremarqinnovations.com.
5. Kawneer North America: www.kawneer.com/#sle.
6. Manko Window Systems, Inc: www.mankowindows.com/#sle.
7. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
8. Pittco Architectural Metals Inc: www.pittcometals.com/#sle.
9. Tubelite, Inc: www.tubeliteinc.com/#sle.
10. Wausau Window and Wall Systems: www.wausauwindow.com.
11. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
12. EFCO, LLC: www.efcocorp.com.
13. Vitro Architectural Products: www.vitroamerica.com.
14. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Glazing Position: Front-set.
2. Finish: Class I color anodized.
3. Finish Color: Dark bronze.
4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.

9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested according to ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.

a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

2. Air Leakage: 0.06 cfm/sq feet maximum leakage of storefront wall area when tested according to ASTM E283/E283M at 1.57 psf pressure difference.

3. Air Leakage: 0.06 cfm/sq feet maximum leakage of storefront wall area when tested according to ASTM E283/E283M at 1.57 psf pressure difference.

2.3 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

1. Framing members for interior applications need not be thermally broken.

2. Framing members around exterior door perimeters need not be thermally broken.

3. Glazing Stops: Flush.

B. Swing Doors: Same manufacturer; products: Kawneer 500 Series Tubelite Wide Stile or an approved equivalent.

1. Thickness: 1-3/4 inches.

2. Top Rail: 5 inches wide.

3. Vertical Stiles: 5 inches wide.

4. Bottom Rail: 10 inches wide.

5. Glazing Stops: Square.

6. Door Framing Members: Tubular aluminum sections, non-thermally broken.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Manufacturer's standard corrosion-resistant nonstaining nonbleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

C. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

E. Glazing Accessories: See Section 08 80 00.

2.5 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

2.6 HARDWARE

A. For each door, include weatherstripping.

1. The Project Coordinator shall determine if other door hardware to be installed on the products of this section are to be supplied by this section. Coordinate with suppliers of both aluminum doors and door hardware.

B. Other Door Hardware: See Section 08 71 00.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

2.7 ACCESSORIES

A. Shims: Plastic shims.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install wall system according to manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install glass according to Section 08 80 00, using glazing method required to achieve performance criteria.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.5 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

Section 08 71 00.10 - Door Hardware – (Main Building)

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 commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.

2. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.

2. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

2. ICC/IBC - International Building Code.

3. NFPA 70 - National Electrical Code.

4. NFPA 80 - Fire Doors and Windows.

5. NFPA 101 - Life Safety Code.

6. NFPA 105 - Installation of Smoke Door Assemblies.

7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.

2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.

5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.

   b. Manufacturer of each item.

   c. Fastenings and other pertinent information.

   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

   e. Explanation of abbreviations, symbols, and codes contained in schedule.

   f. Mounting locations for door hardware.

   g. Door and frame sizes and materials.

   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the 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 Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.

2. Faulty operation of the hardware.

3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Products. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to Arrow. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded Arrow.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and according to the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.

b. Three Hinges: For doors with heights 61 to 90 inches.

c. Four Hinges: For doors with heights 91 to 120 inches.

d. 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.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.

b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. McKinney (MK) - TA/T4A Series, 5 knuckle.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.

2. Furnish dust proof strikes for bottom bolts.

3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.

4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

a. Rockwood (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.

2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.

3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.

4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.

5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

6. Manufacturers:

a. Rockwood (RO).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

a. Match Existing, Field Verify.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.

2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

4. Tubular deadlocks and other auxiliary locks.

5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)

2. Master Keys (per Master Key Level/Group): Five (5).

3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).

b. MMF Industries (MM).

c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.

2. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 12.3 million cycles or greater.

3. Manufacturers:

a. Arrow, formerly known as Yale (YA) - 8800FL Series.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.

2. Strikes for Bored Locks and Latches: BHMA A156.2.

3. Strikes for Auxiliary Deadlocks: BHMA A156.36.

4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.

2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for through-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.

   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Tubular Panic Devices: ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Device to be ADA compliant requiring less than 5 lbs. of force to activate. Post mounting with optional mechanical dogging. Provide proper fasteners as required by manufacturer to meet application requirements. Provide exit devices on both leaves of pairs of doors.

1. Style: Exposed vertical rod. 1-1/4” grip diameter with interior operating panic handle in combination with exterior fixed pull handle. Panic mechanism shall be concealed within brass or stainless steel tubing. Optional entrance from exterior by a keyed cylinder.

2. Configurations (provide as specified):

   a. Half Height L-Shape Pull.

3. Push/pull operation when dogged from the inside.

4. Latching: Top latching. Reversed, flat, Pullman style. Roller-type latching not acceptable.

5. Engraved "PUSH" signage with optional paint infill and boundary grooves.

6. Manufacturers:

a. Rockwood (RO) - PDU8500 Series.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 through 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Arrow, formerly known as Yale (YA) - 4400 Series.

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

a. Arrow, formerly known as Yale (YA) - Unitrol Series.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Rockwood (RO).

2.11 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

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. Manufacturers:

1. Pemko (PE).

2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, 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. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

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.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK – McKinney
2. PE – Pemko
3. RO – Rockwood
4. YA - Arrow, formerly known as Yale
5. HS – HES
6. OT – Other
7. SU – Securitron

8.

Hardware Sets

Set: 1.0

Doors: 101A, 103A

2 Continuous Hinge	CFM_SLF-HD1 x Length Required		PE	087100
2 Storefront Panic Device	PDU8500-1 01 (Keyed as Required)	US32D	RO	087100
2 Drop Plate	486	689	YA	087100
2 Blade Stop	891	689	YA	087100
2 Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA	087100
1 Threshold	273x224AFGT x MSES25SS x Length Required		PE	087100
1 Gasketing	Provided By Door/Frame Supplier		OT	
2 Sweep	3452CNB x Length Required		PE	087100

Notes: Perimeter Weatherstrip by the Aluminum Door Manufacturer.

Set: 2.0

Doors: 111A

6 Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK	087100
1 Self Latching Flush Bolt Set	2845 / 2945 (as required)	US26D	RO	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
2 Surface Closer	UNI4410 (HD PA SPG STP Arm w/HO - EXT)	689	YA	087100
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Threshold	175A MSES25SS x Length Required		PE	087100
1 Gasketing	303AS (Head & Jambs)		PE	087100
1 Rain Guard	346C x Width of Frame Head		PE	087100
2 Sweep	3452CNB x Length Required		PE	087100
2 Astragal	29324CNB x Door Height		PE	087100

Set: 2.1

Doors: 110A

3	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK	087100
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1	Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA	087100
1	Electric Strike	1600-CS	630	HS	087100
1	ElectroLynx Adaptor	2004M		HS	087100
1	SMART Pac Bridge Rectifier	2005M3		HS	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Threshold	175A MSES25SS x Length Required		PE	087100
1	Gasketing	303AS (Head & Jambs)		PE	087100
1	Rain Guard	346C x Width of Frame Head		PE	087100
1	Sweep	3452CNB x Length Required		PE	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Frame)	QC-C3000P		MK	087100
1	Position Switch	DPS-MW-BK/GY/WH (as required)		SU	087100
1	Motion Sensor	XMS		SU	087100
1	Power Supply	AQD (Size and Options as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: This opening is scheduled and is to be wired for future access control operation. Coordinate all Wiring and conduit with electrical contractor.

Intended Future Operation Description:
• The door is normally closed and secure.
• When a proper credential is presented to the Card Reader (by Others) the power supply will momentarily release the electric strike to allow entry.
• Egress from the unsecured side is always available by turning the lever on the lockset. Request to Exit Sensor on the unsecure side of the opening will signal and authorized egress to access control.
• Door Position Switch will monitor the doors OPEN/CLOSED status.
• Key on secured side will retract latch to allow entry.
• Electric Strike is Fail Secure and will remain locked in the event of a fire emergency or power outage.

Set: 3.0

NOT USED

3 Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK	087100
1 Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1 Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Threshold	175A MSES25SS x Length Required		PE	087100
1 Gasketing	303AS (Head & Jambs)		PE	087100
1 Rain Guard	346C x Width of Frame Head		PE	087100
1 Sweep	3452CNB x Length Required		PE	087100

Set: 4.0

Doors: 101B, 103B

2 Continuous Hinge	CFM_SLF-HD1 x Length Required		PE	087100
2 Door Pull	RM3301 (Full Door Height - HD Back-to-Back Mounting)	US32D	RO	087100
2 Drop Plate	486	689	YA	087100
2 Blade Stop	891	689	YA	087100
2 Surface Closer	4420 (HD PA SPG STP Arm)	689	YA	087100
1 Gasketing	Provided By Door/Frame Supplier		OT	

Notes: Perimeter Weatherstrip and astragals by the Aluminum Door Manufacturer.

Set: 5.0

Doors: 001, 111B

3 Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1 Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1 Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 5.1

Doors: 110B

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Electric Strike	1600-CS	630	HS	087100
1	ElectroLynx Adaptor	2004M		HS	087100
1	SMART Pac Bridge Rectifier	2005M3		HS	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Frame)	QC-C3000P		MK	087100
1	Position Switch	DPS-MW-BK/GY/WH (as required)		SU	087100
1	Motion Sensor	XMS		SU	087100
1	Power Supply	AQD (Size and Options as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: This opening is scheduled and is to be wired for future access control operation.
Coordinate all Wiring and conduit with electrical contractor.

Intended Future Operation Description:
• The door is normally closed and secure.
• When a proper credential is presented to the Card Reader (by Others) the power supply will momentarily release the electric strike to allow entry.
• Egress from the unsecured side is always available by turning the lever on the lockset. Request to Exit Sensor on the unsecure side of the opening will signal and authorized egress to access control.
• Door Position Switch will monitor the doors OPEN/CLOSED status.
• Key on secured side will retract latch to allow entry.
• Electric Strike is Fail Secure and will remain locked in the event of a fire emergency or power outage.

Set: 6.0

NOT USED

3 Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1 Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1 Surface Closer	4420 (HD PA SPG STP Arm)	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
3 Silencer	608		RO	087100

Set: 6.1

Doors: 115

3 Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and size as required)	US26D	MK	087100
1 Rim Exit Device, Nightlatch	7150 TB627F (Keyed as Required)	630	YA	087100
1 Surface Closer	4420 (HD PA SPG STP Arm)	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
3 Silencer	608		RO	087100

Set: 7.0

Doors: 113B, 114

3 Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1 Office Lock	TBR 8807RL (Keyed as Required)	630	YA	087100
1 Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1 Silencer	608		RO	087100

Set: 8.0

Doors: 104, 105, 112

3	Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1	Privacy Lock (w/OCC IND)	TBR 8802RL V21	630	YA	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100
1	Coat Hook	RM801	US26D	RO	087100

Set: 9.0

Doors: 106A, 107A, 108A, 109A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and size as required)	US26D	MK	087100
1	Mortise Deadlock (Double Key/Classroom)	356 (Key as Required)	630	YA	087100
1	Push Plate	70C-RKW	US32D	RO	087100
1	Pull	RM3020-12 Mtg-Type 12XHD	US32-316	RO	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100

Notes: Door can be locked into alternate jamb when opened 90 degrees. (Two Deadbolt Strikes are required)

END OF SECTION

Section 08 71 00.20 - Door Hardware – (Maintenance Building)

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 commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.

    b. Manufacturer of each item.

    c. Fastenings and other pertinent information.

    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

    e. Explanation of abbreviations, symbols, and codes contained in schedule.

    f. Mounting locations for door hardware.

    g. Door and frame sizes and materials.

    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the 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 Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.

2. Faulty operation of the hardware.

3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Products. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to Arrow. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded Arrow.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and according to the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.

b. Three Hinges: For doors with heights 61 to 90 inches.

c. Four Hinges: For doors with heights 91 to 120 inches.

d. 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.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.

b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. McKinney (MK) - TA/T4A Series, 5 knuckle.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.3 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

a. Match Existing, Field Verify.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.

2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

4. Tubular deadlocks and other auxiliary locks.

5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

6. Keyway: Match Facility Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

3. Existing System: Field verify and key cylinders to match Owner's existing system.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)

2. Master Keys (per Master Key Level/Group): Five (5).

3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.

2. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 12.3 million cycles or greater.

3. Manufacturers:

a. Arrow, formerly known as Yale (YA) - 8800FL Series.

2.5 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.6 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 through 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:
    a. Arrow, formerly known as Yale (YA) - 4400 Series.

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:
    a. Arrow, formerly known as Yale (YA) - Unitrol Series.

2.7 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Rockwood (RO).

2.8 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

2.9 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

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. Manufacturers:

1. Pemko (PE).

2.10 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.11 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, 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. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

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.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK – McKinney

2. PE – Pemko

3. RO – Rockwood

4. YA - Arrow, formerly known as Yale

5. HS – HES

6. OT – Other

7. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 101B, 101C

3	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA
1	Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO
1	Gasketing	303AS (Head & Jambs)		PE
1	Rain Guard	346C x Width of Frame Head		PE
1	Sweep	3452CNB x Length Required		PE
1	Threshold	175A MSES25SS x Length Required		PE

Set: 2.0

Doors: 101A

1	Hardware by Door/Frame Supplier	Hardware by Door/Frame Manufacturer		OT

END OF SECTION

Section 08 79 13 - Key Storage Equipment

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Key Lock Box.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of exterior finishes, weather barrier, flashings and sealants.

1. Ensure a flat smooth surface from rough opening of vault equipment to a minimum of 1 beyond the vault equipment flange is provided.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide installation instructions and product data covering all components of the specified products.

1.4 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide manufacturers standard product warranty.

PART 2 PRODUCTS

2.1 KEY BOX

A. Manufacturers

1. KNOX Company: www.knoxbox.com.

a. Verify with the city in which the project is located if box must be purchased from that city prior to bidding on the project.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Key Box - High Security Industrial/Government Key Box.

1. Exterior Dimension: 4 inch high, 5 inch wide, 3.25 inch deep.

2. Color: As selected by Architect.

3. Mounting: Recessed.

4. Product: Knox-Box 3200 Series Hinged Door Model.

2.2 ACCESSORIES

A. Fasteners: Manufacturer standard for mounting type indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify recess in precast panel is according to manufacturer recommendation for width, depth, and height.

B. Verify the recess location is plumb.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Take care to make sure that the front of the shell housing, including the cover plate and screw heads, are flush with the finish face of wall.

3.3 TOLERANCES:

A. Maximum Variation From True Position: 1/16 inch.

B. Maximum Offset From True Alignment: 1/16 inch.

3.4 CLEANING

A. Clean box inside and out of any dust and debris.

3.5 PROTECTION

A. Protect installed box from subsequent construction operations.

END OF SECTION

Section 08 80 00 – Glazing

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.2 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors.

B. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.3 REFERENCE STANDARDS

A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

H. GANA (SM) - GANA Sealant Manual; 2008.

I. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Samples: Submit two samples 12 by 12 inch in size of glass units.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.6 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Float Glass Manufacturers:

1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.

2. Guardian Glass, LLC: www.guardianglass.com/#sle.

3. Pilkington North America Inc: www.pilkington.com/na/#sle.

4. Saint Gobain North America: www.saint-gobain.com/#sle.

5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

6. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.

2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.

3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.

1. In conjunction with weather barrier related materials described in other sections.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are according to manufacturer's published data as determined with the following procedures and/or test methods:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

2.4 INSULATING GLASS UNITS

A. Basis of Design: Products listed by Viracon are considered the "basis of design" and not considered proprietary. Submit two 12 inch by 12 inch samples of insulated glass units to Architect for acceptance for all other products.

B. Do not provide coatings on tinted glass that change the appearance from the intended color. Alternate combination of tinted glass and coatings will be considered and will only be approved based on actual sample.

C. Manufacturers:

1. Glass: Any of the manufacturers specified for float glass.
2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
3. Guardian Glass, LLC: www.guardianglass.com/#sle.
4. Pilkington North America Inc: www.pilkington.com/na/#sle.
5. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
6. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
7. Oldcastle Building Envelope: www.obe.com.
8. Substitutions: See Section 01 60 00 - Product Requirements.

D. Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Spacer Color: Black.
4. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
    b. Color: Black.
5. Purge interpane space with dry air, hermetically sealed.

E. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.

1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Performance Values: Based on Viracon's VE1-2M. (Clear).

F. Type IG-2 - Insulating Glass Units: Vision glass, double glazed.

1. Same as IG - 1; Bird Safe; As scheduled/indicated on the drawings.

G. Type IG-3 - Insulating Glass Units: Vision glass, double glazed, laminated.

1. Same as IG - 1; Laminated Exterior Lite; 1/8 inch, .030 inch PVB, 1/8 inch. Laminated as selected by the Architect.

2.5 GLAZING UNITS

A. Type G-1 - Monolithic Interior Vision Glazing:

1. Applications: Interior glazing unless otherwise indicated.

2. Glass Type: Fully tempered float glass.

3. Tint: Clear.

4. Thickness: 1/4 inch, nominal.

2.6 GLAZING COMPOUNDS

A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.7 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants according to ASTM C1193, GANA (SM), and manufacturer's instructions.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.6 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion according to glass manufacturer's written recommendations.

3.7 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

Section 09 05 61 - Common Work Results for Flooring Preparation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:

1. Carpet tile.

2. Any type of flooring that can trap moisture and cause failure of setting adhesives.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Patching compound.

F. Remedial floor coatings.

1.2 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

1.3 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.

2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

D. Testing Agency's Report:

1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Submit report to Architect.
7. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

F. Copy of RFCI (RWP).

G. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

1.6 QUALITY ASSURANCE

A. The flooring contractor shall begin tracking and monitoring Moisture and pH testing results 4 weeks prior to scheduled installation of resilient flooring.

B. Report all results, in writing, to the General Contractor and Architect.

C. Moisture and pH testing may be performed by flooring installers own personnel.

D. In the event that test values exceed manufacturer's limits, a third party testing agency may be brought in to retest and verify the results.

1. The Owner shall pay for third party testing.

E. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

F. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

G. Contractor's Responsibility Relating to Independent Agency Testing:

1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

H. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products according to manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.

2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.

3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested according to ASTM C109/C109M or ASTM C472, whichever is appropriate.

4. Products:

a. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.

b. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.

c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.

1. Products:

a. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.

b. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.

c. GCP Applied Technologies; Kovara AB 300: www.gcpat.com/#sle.

d. H.B. Fuller Construction Products, Inc; TEC LiquiDam with TEC Level Set 200 SLU: www.tecspecialty.com/#sle.

e. LATICRETE International, Inc; LATICRETE NXT Vapor Reduction Coating with LATICRETE NXT Level Plus: www.laticrete.com/#sle.

f. Maxxon Corporation; Aquafin SG2: www.maxxon.com/#sle.

g. SCHONOX SHP (Special Acrylic Primer), EPA (Two-Part, Epoxy Based Moisture Mitigation System), and ZM (Cement Based Self-Leveling Compound by SCHONOX HPS North America: www.hpsubfloors.com.

h. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer and Sikafloor Self-Leveling Moisture Tolerant Resurfacer : www.sikafloorusa.com.

i. Sinak: www.sinak.com.

j. Tnemec Company, Inc; Series 208 Epoxoprime MVT: www.tnemec.com/#sle.

k. USG Corporation; Durock Brand CST Moisture Vapor Reducer: www.usg.com/#sle.

l. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:

1. Preliminary cleaning.
2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Grinding, filling, and leveling, as required.
8. Other preparation specified.
9. Adhesive bond and compatibility test.
10. Protection.

B. Notification:

1. Notify the Owner/Architect immediately upon discovery of test results that inhibit proper installation of flooring products. Owner/Architect will determine how to proceed.

C. Remediations:

1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.3 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test according to ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.4 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test according to ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.5 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.6 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.7 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.8 APPLICATION OF REMEDIAL FLOOR COATING

A. Install according to coating manufacturer's instructions.

B. Comply with requirements and recommendations of coating manufacturer.

3.9 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

Section 09 21 16 - Gypsum Board Assemblies

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall/ceiling/soffit/bulkhead framing.

C. Acoustic insulation.

D. Gypsum wallboard.

E. Joint treatment and accessories.

F. Prefabricated Wood Blocking System.

G. Drywall Grid Suspension System.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.3 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

H. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

K. ASTM E413 - Classification for Rating Sound Insulation; 2022.

L. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

M. GA-214 - Recommended Levels of Gypsum Board Finish; Gypsum Association; 2021.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate the location of all expansion joints in plan and elevation view. Include details at intersections of walls, floors, ceilings, and other construction.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of documented experience.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC as indicated calculated according to ASTM E413, based on tests conducted according to ASTM E90.

2. Walls indicated to received sound insulation that are not indicated to meet an STC rating are not intended to be constructed as an acoustic assembly.

2.2 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

1. ClarkDietrich: www.clarkdietrich.com/#sle.

2. Marino: www.marinoware.com.

3. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.

4. The Steel Network, Inc: www.steelnetwork.com.

5. Custom Stud, Inc: www.customstud.com.

6. Telling Industries: www.buildstrong.com.

7. Super Stud Building Products, Inc: www.buysuperstud.com.

8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Shapes and Sizes: As indicated on the drawings and as follows.

a. Studs: "C" shaped with flat or formed webs.

b. Runners: "U" shaped, sized to match studs.

C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

D. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.

1. Main runners with double stitched web for added strength and knurled face for easier screw installation.

2. Cross tees feature staked-on end tabs for optimal tightness and ease of installation; Stepped-end design featured on cross tees

3. Material: Classified Heavy Duty per ASTM C635; Utilizes G40 hot-dipped galvanized construction for superior corrosion resistance.

4. Products:

a. USG Corporation; Drywall Suspension System: www.usg.com/#sle.

b. Armstrong; Drywall Grid System: www.armstrongceilings.com.

c. Certainteed; Dywall Suspension System: www.certainteed.com.

d. Rockfon; Chicago Metallic Drywall Grid: www.rockfon.com.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum Company: www.americangypsum.com.

2. CertainTeed Corporation: www.certainteed.com.

3. Georgia-Pacific Gypsum: www.gpgypsum.com.

4. National Gypsum Company: www.nationalgypsum.com.

5. PABCO Gypsum: www.pabcogypsum.com.

6. USG Corporation: www.usg.com.

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

3. Thickness:

a. Vertical Surfaces: 5/8 inch.

b. Ceilings: 5/8 inch.

2.4 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 or more inches as required to fill wall depth.

1. ASTM E84 surface burning characteristics: Flame Spread Index 25 or less; Smoke Developed Index 450 or less.

B. Sheet Vapor Retarder: Clear polyethylene film for above grade application, 6 mil thick.

C. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, rigid plastic, or aluminum, unless noted otherwise.

1. Types: As detailed or required for finished appearance.

a. Products for specific applications:

(1) Expansion Joints (V-Groove Joint): Trim-Tex #093V Expansion joint or approved equal shall be used at expansion joints in flat wall or ceiling applications.

(2) Angled Joints: Trim-Tex Magic Corner or approved equal shall be used at angular walls and ceilings.

(3) Wall Termination: Trim-Tex Tear Away XT Extra Tall Masking or approved equal shall be used at all locations where new construction terminates into existing construction or non-gypsum construction.

2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.

3. Products:

a. Same manufacturer as framing materials.

b. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.

c. Trim-Tex Inc.: www.trim-tex.com.

d. Fry Reglet: www.fryreglet.com.

e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.

2. Joint Compound: Drying type, vinyl-based, ready or field-mixed.

3. Joint Compound (Optional): Setting type, field-mixed.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

G. Prefabricated Blocking Systems: DANBACK 3/4 inch standard/treated plywood or approved equal: www.danback.com.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install according to ASTM C754 and manufacturer's instructions.

B. Drywall Grid Suspension System Ceilings: Install suspension system according to manufacturers instructions.

C. Studs: Space studs at 16 inches on center.

1. Extend partition framing to structure where indicated and to ceiling in other locations.

2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track according to manufacturer's instructions.

3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Blocking: Install wood blocking for support of:

1. All items indicated on the drawings and in the specifications.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install according to manufacturer's instructions.

1. Place one bead continuously on substrate before installation of perimeter framing members.

2. Place continuous bead at perimeter of each layer of gypsum board.

3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Provide solid continuous shims under first layer of gypsum board as necessary to minimize variations in plane. Tolerance of surface shall be as indicated.

C. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

1. Exception: Tapered edges to receive joint treatment at right angles to framing.

D. Installation on framing: Use screws for attachment of boards.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:

1. Not more than 30 feet apart on walls, soffits, and ceilings in any direction.

2. At intersections of soffits and intersecting walls.

3. At intersection of half height wall and intersecting walls.

4. At locations indicated on the drawings.

5. Other locations where cracking may occur due to changes in height and structure.

6. All jointing locations shall be indicated on shop drawings.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying or setting joint compound and finish with drying or setting joint compound.

B. Finish gypsum board according to levels defined in ASTM C 840 (additional reference guideline; GA-214 - Recommended Levels of Gypsum Board Finish), as follows:

1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas including the following: (Level 5 shall be a thin skim coat of joint compound trowel applied; no spray or roller applied products will be accepted.)

a. Walls that are perpendicular to large glazed openings where glazed openings are 50% or more of the area of the wall, within the room, in which they are located.

b. Tall wall 16'-0" and taller.

c. Long walls and ceilings 30'-0" and longer.

d. Large wall and ceilings area of 500 square feet and larger.

e. Walls with glass-mat-faced wallboard products.

f. Walls, ceilings, and areas specifically indicated on the drawings.

2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

    a. No visible defects should be apparent under normal lighting conditions. Provide Level 5 finish where defects become apparent at no additional cost to the Owner.

    b. Contractors that cannot guarantee their Level 4 finish will be free of visible defects under normal lighting conditions should provide a Level 5 finish.

    c. If the Architect or Owner is unsatisfied with a Level 4 finish due to visible defects under normal lighting conditions then a Level 5 finish shall be installed at no additional cost to the Owner. No exceptions.

3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.

4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

2. Tapered edges of gypsum board that are not located at taped and filled joints shall also be filled and sanded smooth to match the plane of the wall.

3.7 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

Section 09 30 00 – Tiling

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Non-ceramic trim.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.3 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.

1. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile; 2020.

2. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

3. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2019.

4. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

B. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2023.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Verification Samples: Submit two samples in actual sizes illustrating color and pattern for each tile product specified.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Tile: 2 percent of each size, color, and surface finish combination, but not less than 3 of each type.

1.5 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

PART 2 PRODUCTS

2.1 TILE

A. Tile Finishes:

1. Products as scheduled on the drawings including:

a. Tile Flooring.

b. Wall Tiles.

2. Other Approved Manufacturers:

a. As listed below; However, submit samples during the bidding process for Architect's review and approval.

b. Samples must be submitted a minimum of 12 days before bids are due to allow Architect adequate time to compare product samples before approving equivalent products.

c. Products that are not submitted for approval will not be accepted at any point during the shop drawing process or construction.

d. Substitutions: See Section 01 6000 - Product Requirements.

B. Manufacturers: All products by the same manufacturer as scheduled .

1. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.

1. Products: As scheduled on the drawings.

2. Applications:

a. Open edges of wall and floor tile where a finished tile edge is not provided or another type of termination is not indicated on the drawings.

3. Manufacturers:

a. Schluter-Systems: www.schluter.com/#sle.

b. M-D Building Products: www.mdteam.com.

c. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 SETTING MATERIALS

A. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.

1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.

2. Products:

a. ARDEX Engineered Cements: www.ardexamericas.com.

b. LATICRETE International, Inc: www.laticrete.com.

c. ProSpec, an Oldcastle brand: www.prospec.com.

d. Bostik, Inc: www.bostik-us.com.

e. Custom Building Products: www.custombuildingproducts.com.

f. Tec Specialty: www.tecspecialty.com.

g. MAPEI Corporation: www.mapei.us.

h. H.B. Fuller Construction Products Inc: www.tecspecialty.com.

i. Substitutions: See Section 01 60 00 - Product Requirements.

2.4 GROUTS

A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.

1. Color(s): As indicated on drawings.

2. Products:

a. ANSI A 118.3, 100% solids epoxy grout; use for all applications. Opticolor by MAPEI or approved equivalent.

2.5 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.

1. Thickness: 20 mils, maximum.

2. Crack Resistance: No failure at 1/8 inch gap, minimum.

a. Cracks exceeding 1/8 inch shall be treated according to TCNA handbook. Do not exceed the limitation of each product. Provide a combination of product when required to isolate larger cracks, sawed joints, and construction joints.

3. Description and Locations: Sheet membrane and liquid applied materials for isolating cracks and joints in floor; covering of entire floor is not intended unless specifically noted or required by flooring manufacturer.

4. Products:

a. Laticrete 170 Sound N' Crack Isolation Mat.

b. Mapeguard 2 by Mapei.

c. NobleSeal TS by the Noble Company.

d. CrackBuster Pro Crack Prevention Mat Underlayment by Custom Building Products.

e. TEC HydraFlex with Mesh by Fuller Construction Products, Inc.

f. RedGard with Mesh by Custom Building Products.

g. Mapelastic CI with Mesh by MAPEI.

h. GoldPlus with Mesh by Bostik.

i. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - GENERAL

A. Install tile and thresholds and grout according to applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim according to manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install according to TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with epoxy grout, unless otherwise indicated.

1. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install according to TCNA (HB) Method F115.

2. Isolate cracks and joints in concrete floor with crack isolation membrane.

3.5 INSTALLATION - WALL TILE

A. Over interior concrete and masonry install according to TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.6 CLEANING

A. Clean tile and grout surfaces.

3.7 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

Section 09 51 00 - Acoustical Ceilings

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Wood Veneer Acoustic Panels and Suspension System.

1.2 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and changes in elevation. Detail each type of junction and elevation change at no less than 1-1/2 inch per 12 inches annotating all related materials.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples 4 by 4 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.5 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.6 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
3. USG Corporation: www.usg.com/ceilings/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wood Veneer Acoustic Panels:

1. Armstrong World Industries, Inc: www.armstrongceilings.com.
2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Suspension Systems:

1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

1. ASTM E84 surface burning characteristics: Flame Spread Index 25 or less; Smoke Developed Index 50 or less.

B. Acoustical Panels: Mineral fiber with membrane-faced overlay, with the following characteristics:

1. Classification: ASTM E1264 Type IV.
   a. Form: 2, water felted.
   b. Pattern: "E" - lightly textured.
2. Size: 24 by 24 inches.
3. Thickness: 3/4 inch.
4. Panel Edge: Reveal.
5. Color: White.
6. Suspension System: Exposed grid.
7. Products: As scheduled on the Drawings.

C. Wood Veneer Acoustic Panels: Particle board core with wood veneer face and non-woven acoustical fabric backer.

1. Panel Size: 12 by 48 inches.
2. Panel Thickness: 3/4 inch.
3. Installation:
   a. Suspension System: Concealed grid.
4. Products: As scheduled on the Drawings.

2.3 SUSPENSION SYSTEM(S)

A. Manufacturers:

1. Same as for acoustical units.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

D. Exposed Suspension System: Hot-dip galvanized steel grid and cap.

1. Application(s): Exposed Grid Unless Indicated Otherwise.

2. Structural Classification: Intermediate-duty, when tested according to ASTM C635/C635M.

3. Profile: Tee; 15/16 inch face width.

4. Construction: Double web.

5. Finish: Baked enamel.

6. Color: White.

E. Concealed Suspension System: Hot-dip galvanized steel grid and cap.

1. Application(s): Wood Veneer Acoustic Panel Suspension System.

2. Structural Classification: Heavy-duty, when tested according to ASTM C635/C635M.

3. Profile: Tee; 15/16 inch face width.

4. Construction: Double web.

5. Finish: Baked enamel.

6. Color: Black.

2.4 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

1. At Non-concealed Grid and Elevation Changes in Grid: Provide extruded aluminum pieces by same manufacturer as grid in height and profile indicated.

a. Manufactured by same grid manufacturer.

b. Edge height: As indicated.

2. At Concealed Grid: Provide exposed L-shaped molding.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system according to ASTM C 636/C 636M and ASTM C 636/C 636M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

2. Overlap and rivet corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units according to manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install units after above-ceiling work is complete.

F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

G. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.

2. Make field cut edges of same profile as factory edges.

H. Install hold-down clips on panels within 10 feet of an exterior door.

3.4 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

Section 09 65 00 - Resilient Flooring

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient base.

B. Installation accessories.

1.2 REFERENCE STANDARDS

A. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2023.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Wall Base: 20 linear feet of each type and color.

3. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing resilient flooring installation, with minimum of five years of documented experience.

1.5 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TV, vinyl, thermoplastic; top set Style B, Cove.

1. Manufacturers:

a. Burke Flooring: www.burkemercer.com.

b. Johnsonite, a Tarkett Company: www.johnsonite.com.

c. Roppe Corp: www.roppe.com.

d. Allstate: www.allstaterubber.com.

e. nora: www.norarubber.com.

f. Flexco: www.flexcofloors.com.

2. Height: 4 inch.

3. Thickness: 0.125 inch thick.

4. Finish: Satin.

5. Length: Roll.

2.2 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Moldings, Nosings, Transitions, and Edge Strips: Same material as flooring.

D. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

1. Fill all voids with approved products to create a solid and continuous surface at all resilient base locations.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

1. Test according to Section 09 05 61.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install according to manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 48 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Minimum 24 inches to splice from any outside corner.

D. Install base on solid backing. Bond tightly to wall and floor surfaces.

E. Scribe and fit to door frames and other interruptions.

3.5 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean according to manufacturer's written instructions.

C. Where required and/or recommended seal and wax resilient flooring products according to manufacturer's instructions; 2 coats minimum.

3.6 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Contractor shall furnish and install all waxing of resilient flooring where manufacturer's installation and/or maintenance instructions require it to be installed. Waxing shall be completed prior to substantial completion.

END OF SECTION

Section 09 66 23 - Resinous Matrix Terrazzo Flooring

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Epoxy matrix terrazzo with ground and polished finish.

B. Divider strips.

C. Termination edging.

D. "Integral" wall base.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete subfloor with steel trowel finish.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Testing of concrete slabs, removal of existing floor coverings and coating (where applicable), cleaning, and preparation.

1.3 REFERENCE STANDARDS

A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

B. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.

C. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for divider strips, control joint strips, expansion joints, and sealer; include printed copy of current NTMA recommendations for type of terrazzo specified.

1. Include data for edge, termination, and similar strips and supports.

C. Shop Drawings: Indicate divider strip and control and expansion joint layout, and details of adjacent components. For precast units, detail profile and anchorage requirements.

1. Include layout and details of all edge, termination, and similar strips and supports.

D. Samples: Submit two samples, 12 inch by 12 inch in size illustrating color, chip size and variation, chip gradation, matrix color, and typical divider strip.

E. Cleaning and Maintenance Data: Include procedures for stain removal, stripping, and sealing.

1.5 QUALITY ASSURANCE

A. Perform work according to NTMA recommendations as posted at their web site at www.ntma.com.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store terrazzo materials in a dry, secure area.

B. Maintain minimum temperature of 55 degrees F.

C. Keep products away from fire or open flame.

1.7 FIELD CONDITIONS

A. Do not install terrazzo when temperature is below 50 degrees F or above 90 degrees F.

B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design - Resinous Matrix Terrazzo Flooring: Terrazzo & Marble Supply Companies; Terroxy Resin Systems: www.tmsupply.com/#sle.

B. Other Acceptable Manufacturers - Resinous Matrix Terrazzo Flooring:

1. Hi-Tek Polymers, Inc: www.hitekpolymers.com.

2. Key Resin Company: www.keyresin.com.

3. Sherwin-Williams Company: General Polymers Brand: www.generalpolymers.com.

4. Sika Corporation: www.sikafloorusa.com.

5. Terrazzco, a brand of Concord Terrazzo Company, Inc: www.terrazzco.com/sle.

6. Terrazzo & Marble Supply Companies: www.tmsupply.com.

2.2 EPOXY MATRIX TERRAZZO APPLICATIONS

A. Floors:

1. Thickness: 3/8 inch, nominal.

2. Aggregate Type: As called out in the finish schedule on the Drawings.

3. Aggregate Size: As called out in the finish schedule on the Drawings.

2.3 MATERIALS

A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.

B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.

C. Aggregate: Type as indicated; sized according to NTMA aggregate gradation standards; color(s) as indicated, uniform in color.

D. Finishing Grout: Epoxy, color to match terrazzo matrix.

2.4 ACCESSORIES

A. Divider Strips: 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strips, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.

C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.

D. Base Cap, Base Divider Strip, and Separator Strip: Match divider strips.

E. Edge and Termination Strips: Match divider strips. Provide support where structure is not supported at locations such as expansion joints and similar locations.

F. Sealer: Colorless, non-yellowing, penetrating liquid type to completely seal matrix surface; not detrimental to terrazzo components.

G. Wood Subfloor Joint Tape: Cloth type.

H. Subfloor Filler: Latex type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive terrazzo.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to sub-floor surfaces.

C. Verify that wood sub-floors have 12 percent maximum moisture content.

D. Verify that concrete sub-floor surfaces are ready for terrazzo installation by testing for moisture vapor emission, internal relative humidity, and alkalinity; obtain instructions if test results are not within limits recommended by terrazzo materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Clean substrate of foreign matter.

B. Prepare concrete surfaces according to ICRI 310.2R.

C. Install supports for control joint strips, divider strips, edge strips, termination strips, and other similar accessories where not otherwise supported by adjacent construction.

D. Apply primer according to manufacturer's instructions.

3.3 INSTALLATION

A. Install control joint strips straight and flat to locations indicated.

B. Install divider strips according to pattern approved on shop drawings.

C. Install base and border divider and control joint strips to match floor pattern.

D. Install edge and termination strips at all open edges, not concealed by other finishes, including edges that terminate against interior walls, open floor edges, and similar types of locations.

E. Install terminating cap strip at top of base; attach securely to wall substrate.

F. Place terrazzo mix over substrate to thickness indicated.

3.4 FINISHING

A. Finish terrazzo to NTMA requirements.

B. Grind terrazzo surfaces with power disc machine; sequence with coarse to fine grit abrasive, using a wet method or using a dry grinder with vacuum to control dust.

C. Apply grout to fill voids exposed from grinding.

D. Remove grout coat by grinding, using a fine grit abrasive.

3.5 TOLERANCES

A. Maximum Variation from Flat Surface: 1/4 inch in 10 feet.

B. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch.

3.6 CLEANING

A. Immediately after terrazzo has dried, apply sealer according to manufacturer's instructions.

B. Polish surfaces according to manufacturer's instructions.

3.7 PROTECTION

A. Protect finished terrazzo from damage due to subsequent construction until Date of Substantial Completion.

END OF SECTION

Section 09 68 13 - Tile Carpeting

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet tile flooring, fully adhered.

B. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Testing of concrete slabs, removal of existing floor coverings and coating (where applicable), cleaning, and preparation.

1.3 REFERENCE STANDARDS

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Verification Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum five years documented experience and approved by carpet tile manufacturer.

1.6 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carpet Tile Products:

1. Products as scheduled on the drawings.

2. Other Approved Manufacturers:

a. As listed below; However, submit samples during the bidding process for Architect's review and approval.

b. Samples must be submitted a minimum of 12 days before bids are due to allow Architect adequate time to compare product samples before approving equivalent products.

c. Products that are not submitted for approval will not be accepted at any point during the shop drawing process or construction.

B. Other Approved Carpet Tile Manufacturers:

1. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Moldings and Edge Strips: As scheduled on the drawings.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.

1. Test according to Section 09 05 61.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile according to manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in pattern indicated on the drawings. If no pattern is indicated contract the architect for additional direction.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Provide training classes for owner's cleaning staff by flooring manufacturer's representative prior to substantial completion. Invite Architect's representative to attended class.

1. Contractor's representative to attend class to ensure initial cleaning meets all requirement of products installed under this section.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces.

END OF SECTION

Section 09 77 00 - Glassfiber Reinforced Plastic Panels

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass reinforced plastic panels. (FRP)

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.

1.3 SUBMITTALS

A. See 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit product data on all component.

C. Samples: Submit selection and verification samples for finishes, colors and textures. Submit two samples of each type of panel, trim and fastener.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 01 Product Requirements Sections.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Package sheets on skids or pallets for shipment to site.

C. Storage and Protection: Store panels and accessories dry and indoors. Store material to protect from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

D. Handling: Remove foreign matter from face of panel by using a soft cloth or brush to avoid scratching or abrasions.

1.5 FIELD CONDITIONS

A. Do not install product components when site conditions may be detrimental to successful installation.

B. Maintain temperature and humidity conditions favorable to proper curing of adhesives during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass reinforced plastic panels:

1. Panolam; Product Standard FRP: www.panolam.com.

2. Marlite; Product Standard FRP: www.marlite.com.

3. Crane Composites; Product Glasbord FRP: www.cranecomposites.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Sheet Materials: 3/32 inch thick, Class C, unless class is required to be Class A or B under the International Building Code.

1. Provide sheet material and all trim pieces associated with a complete system from a single manufacturer.

B. Fastening: As recommended by sheet material manufacturer.

C. Adhesives and Sealants: As recommended by sheet material manufacturer.

2.3 FINISH

A. Sheet Color and Texture: As scheduled on the drawings.

B. Trim Color and Texture: As scheduled on the drawings.

2.4 ACCESSORIES

A. Sealant: Tremsil 200 by Tremco Commercial Sealants or equivalent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready to receive work.

B. Inspect all materials for damage and contact product manufacturer with questions or problems.

3.2 INSTALLATION

A. Install all products and accessories in strict accordance with the manufacturer's installation instructions, using approved adhesives and sealants.

B. All moldings must provide for a minimum 1/8 inch of panel expansion at joints and edges.

C. Seal all joints and edges with pvc moldings and sealant.

3.3 TOLERANCES

A. Maximum variation from true position: 1/16 inch.

B. Maximum offset from true alignment: 1/16 inch.

3.4 CLEANING

A. Wipe down using a damp cloth and mild soap solution or cleaner. Refer to manufacturer's specific cleaning recommendations.

END OF SECTION

Section 09 91 13 - Exterior Painting

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

1. Exposed surfaces of primed and unprimed metal items unless specifically indicated to not be painted.

2. Mechanical and Electrical:

a. Shop-primed items.

b. Paint metals that are not resistant to corrosion.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

2. Items indicated to receive other finishes.

3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.

5. Floors, unless specifically indicated.

6. Glass.

7. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2023.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 2 - Hand Tool Cleaning; 2018.

F. SSPC-SP 3 - Power Tool Cleaning; 2018.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

4. Manufacturer's installation instructions.

5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.

3. Allow 15 days for approval process, after receipt of complete samples by Architect.

4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished items, have been approved.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Do not provide or leave extra paint materials for the Owner.

3. Do provide product info, color names, and installation locations for all products and colors. Information shall be included in the Operation and Maintenance Manual.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 feet candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:

1. Base Manufacturer: Sherwin Williams: www.sherwin-williams.com.

2. Other Manufacturers: Approved products shall meet performance and physical characteristics of base manufacturer (basis of design) product including published ratio of solids by volume, plus or minus two percent.

C. Other Acceptable Manufacturers: Submit product information for each line of paint for Architect's approval. Substitutions of Base Manufacturer's products may not be accepted during the shop drawing process.

1. Behr Process Corporation: www.behr.com/#sle.
2. Benjamin Moore & Co: www.benjaminmoore.com.
3. Carboline: www.carboline.com.
4. Diamond Vogel Paints: www.diamondvogel.com/#sle.
5. Hallman Lindsay Paint of Wisconsin: www.hallmanlindsay.com.
6. PPG Paints: www.ppgpaints.com/#sle.
7. Pratt & Lambert Paints: www.prattandlambert.com/#sle.
8. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
9. Tnemec: www.tnemec.com.
10. Valspar Corporation: www.valsparpaint.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
    a. Spayed finish; is preferred on all metal surfaces; is required on the following surfaces:
        (1) Metal doors and frames; prior to hardware installation.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. Provide commercial grade paint systems by approved paint manufacturer for substrates not specifically covered under paint systems.
    a. Consult with Architect/Engineer/Designer for approval of additional products and systems. Provide quantifiable product information.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
    a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation according to 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Where indicated or scheduled colors do not match the paint product lines indicated below it is anticipated that colors will be color matched; product lines below are intended to set a level of standard for the product lines used for each application.

2. Locations Not Indicated: Selection to be made by Architect after award of contract.

3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

F. Coats: The number of coats specified, are based on manufacturer’s recommendations. Provide for additional coats, as necessary, for complete coverage and true color. Additional coats due to a lack of coverage shall be provided at no additional cost to the Owner. No exceptions.

G. Coverage: Do not stretch products beyond their recommended coverage rate nor install fewer coats than specified regardless of appearance after previous coats are applied. Thin product application may show surface imperfections or inconsistencies that would otherwise not be visible. Additional coats due to a lack of proper coverage shall be provided at no additional cost to the Owner. No exceptions.

2.3 PAINT SYSTEMS - EXTERIOR

A. Paint Product: Pro Industrial Acrylic

1. Primer: Prime and/or touch up as per Manufacturers recommended Specifications according to specified Product.

2. Number of Paint Coats Over Primer: Two.

3. Types of Substrates:

a. Steel.

4. Sheen: As scheduled on the drawings.

5. Location Types:

a. Hollow metal doors and frames.

b. Bollards.

c. Steel lintels and structural steel unless noted otherwise.

d. Stair guardrails and handrails.

e. Stair components other than guardrails and handrails.

f. Other metals unless noted otherwise.

B. Paint Product: Pro Industrial Water Based Acrolon 100 Urethane

1. Primer: Pro Industrial Pro-Cryl Universal Acrylic Primer

2. Number of Paint Coats Over Primer: Two.

3. Types of Substrates:

a. Galvanized Steel.

4. Sheen: As scheduled on the drawings.

5. Location Types:

a. Galvanized Steel.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask and/or protect all surfaces, appurtenances not affiliated with coating process, including but not limited to electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Painted Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Painting shall be free from paint runs; no exceptions.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

Section 09 91 23 - Interior Painting

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.

2. Exposed surfaces of primed and unprimed metal items in finished areas unless specifically indicated to not be painted.

3. Mechanical and Electrical:

a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, electrical equipment, and pipes, unless otherwise indicated.

b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

2. Items indicated to receive other finishes.

3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.

5. Floors, unless specifically indicated.

6. Glass.

7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Joint and surface treatment prior to painting.

1.3 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2023.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

4. Manufacturer's installation instructions.

5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.

3. Allow 15 days for approval process, after receipt of complete samples by Architect.

4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished items, have been approved.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Do not provide or leave extra paint materials for the Owner.

3. Do provide product info, color names, and installation locations for all products and colors. Information shall be included in the Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 feet candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:

1. Base Manufacturer: Sherwin Williams: www.sherwin-williams.com.

2. Other Manufacturers: Approved products shall meet performance and physical characteristics of base manufacturer (basis of design) product including published ratio of solids by volume, plus or minus two percent.

C. Other Acceptable Manufacturers: Submit product information for each line of paint for Architect's approval. Substitutions of Base Manufacturer's products may not be accepted during the shop drawing process.

1. Behr Process Corporation: www.behr.com/#sle.

2. Benjamin Moore & Co: www.benjaminmoore.com.

3. Carboline: www.carboline.com.

4. Diamond Vogel Paints: www.diamondvogel.com/#sle.

5. Hallman Lindsay Paint of Wisconsin: www.hallmanlindsay.com.

6. IdeaPaint: www.ideapaint.com.

7. ICP Group: www.icpgroup.com.

8. PPG Paints: www.ppgpaints.com/#sle.

9. Pratt & Lambert Paints: www.prattandlambert.com/#sle.

10. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

11. Tnemec: www.tnemec.com.

12. Valspar Corporation: www.valsparpaint.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

a. Spayed finish; is preferred on all metal surfaces; is required on the following surfaces:

(1) Metal doors and frames; prior to hardware installation.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. Provide commercial grade paint systems by approved paint manufacturer for substrates not specifically covered under paint systems.

a. Consult with Architect/Engineer/Designer for approval of additional products and systems. Provide quantifiable product information.

4. Supply each paint material in quantity required to complete entire project's work from a single production run.

5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2. Determination of VOC Content: Testing and calculation according to 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Where indicated or scheduled colors do not match the paint product lines indicated below it is anticipated that colors will be color matched; product lines below are intended to set a level of standard for the product lines used for each application.

2. Locations Not Indicated: Selection to be made by Architect after award of contract.

3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

F. Coats: The number of coats specified, are based on manufacturer’s recommendations. Provide for additional coats, as necessary, for complete coverage and true color. Additional coats due to a lack of coverage shall be provided at no additional cost to the Owner. No exceptions.

G. Coverage: Do not stretch products beyond their recommended coverage rate nor install fewer coats than specified regardless of appearance after previous coats are applied. Thin product application may show surface imperfections or inconsistencies that would otherwise not be visible. Additional coats due to a lack of proper coverage shall be provided at no additional cost to the Owner. No exceptions.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint Product: Pro Industrial Pre-Catalyzed Waterbased Epoxy (Single-Component)

1. Primer: Prime and/or touch up as per Manufacturers recommended Specifications according to specified Product.

2. Number of Paint Coats Over Primer: Two.

3. Types of Substrates:

a. Steel.

4. Sheen: As scheduled on the drawings.

5. Location Types:

a. Hollow metal doors and frames.

b. Concrete/masonry walls unless noted otherwise.

B. Paint Product: ProMar 200 Zero VOC Interior Latex

1. Primer: One coat primer sealer in all locations; primer shall be installed under paint products even if product is considered self-priming.
2. Number of Paint Coats Over Primer: Two.
3. Types of Substrates:
    a. Gypsum board.
4. Sheen: As scheduled on the drawings.
5. Locations Types:
    a. Ceilings unless noted otherwise.
    b. Soffits unless noted otherwise.
    c. Bulkheads unless noted otherwise.

C. Paint Product: Pro Industrial Water Based Acrolon 100 Urethane

1. Primer: Pro Industrial Pro-Cryl Universal Acrylic Primer
2. Number of Paint Coats Over Primer: Two.
3. Types of Substrates:
    a. Galvanized Steel.
4. Sheen: As scheduled on the drawings.
5. Location Types:
    a. Galvanized Steel.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask and/or protect all surfaces, appurtenances not affiliated with coating process, including but not limited to electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Painting shall be free from paint runs; no exceptions.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

Section 10 12 00 - Display Cases

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Recessed display cases.

1.2 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver display cases and materials to the Project site with manufacturer’s protective crate covering and do not open until ready for use.

B. Protect display cases before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

PART 2 PRODUCTS

2.1 DISPLAY CASES

A. Basis of Design: SCIBBR234-XXxXX by Displays4Sale.

B. Manufacturers:

1. Displays4Sale: www.displays4sale.com.
2. Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
3. MooreCo, Inc: www.moorecoinc.com/#sle.
4. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

C. Enclosed Indoor Bulletin Boards with Radious Edge (Multiple Doors): Factory-fabricated display case with natural cork tackable board backing, finished interior, and aluminum trim on face to cover edge of recessed opening.

1. Size and Configuration: As indicated on the drawings.
2. Doors: Swing 2 lockable cam-lock, 2 keys included.
3. Hinges: Full length pinao hinges.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Refer to drawings for display case mounting heights.

C. Clean case and glass using manufacturers recommended procedures.

D. Provide mitered and wrapped hairline joints for all trims.

3.2 ADJUSTING AND CLEANING

A. Verify that all accessories are installed as detailed for each unit.

B. At completion of work, clean glass surfaces, back panels and trim according to manufacturer’s recommendations leaving units ready for use.

END OF SECTION

Section 10 14 00 – Signage

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Room and door signs.

B. Dimensional Letters.

1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.

2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.

3. Submit for approval by Owner through Architect prior to fabrication.

D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.5 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sign Manufacturers/Suppliers:

1. Accent Signage Systems, Inc: www.accentsignage.com.

2. ADASigns: www.adasigns.com.

3. American Marking, Inc: www.americanmarkinginc.com.

4. Architectural Graphics, Inc.: www.agisign.com.

5. ASI Sign Systems: www.asisignage.com.

6. Best Sign Systems, Inc: www.bestsigns.com.
7. Compliancesigns: www.compliancesigns.com.
8. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com/#sle.
9. Cosco Industries (non-ADA signs): www.coscoarchitecturalsigns.com/#sle.
10. Indigo Signworks: www.indigosignworks.com.
11. Inpro: www.inprocorp.com/#sle.
12. Latitude Signage and Design: www.latitudesignage.com.
13. Mankato Sign Service.
14. Mohawk Sign Systems, Inc: www.mohawksign.com.
15. M&M Signs.
16. Schwaab, Inc: www.schwaab.com.
17. Seton Identification Products: www.seton.com/aec.
18. Sign Pro.
19. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Doors Signs; Accessibility, Service Rooms, and Other Signs Where Indicated:

1. Sign Type: Flat signs with engraved or applied panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
3. Character Height: 1 inch unless otherwise indicated or required by code.
4. Sign Height: 2 inches unless otherwise indicated or required by code.
    a. Fire Riser and Fire Control Rooms (When Applicable): 4 inches in height with a 1/4 inch stroke; arabic font in contrasting colors.
5. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
    a. Service Rooms Shall Include:
        (1) Fire Riser and Control Rooms.
        (2) Mechanical and Electrical Rooms.
6. Rest Rooms: Identify with pictograms, the names "RESTROOM", "MEN", and "WOMEN", room numbers to be determined later, and braille.
7. Other Signs: Identify with room names and numbers to be determined later, not those shown on the drawings.

2.3 SIGN TYPES

A. Flat Signs: Signage media without frame.

1. Edges: Square.
2. Corners: Square.
3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated or required by code:

1. Character Font: Helvetica, Arial, or other sans serif font.

2. Character Case: Upper case only.

3. Background Color: As selected by Architect from the manufacturers standard colors.

4. Character Color: Contrasting color.

2.4 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:

1. Total Thickness: 1/8 inch.

B. Applied Character Panels: Acrylic plastic base, with applied acrylic plastic letters and braille.

1. Total Thickness: 1/8 inch.

2. Letter Thickness: 1/8 inch.

3. Letter Edges: Square.

2.5 DIMENSIONAL LETTERS

A. Metal Letters:

1. Metal: Stainless steel sheet, flat.

2. Metal Thickness: As indicated on drawings.

3. Letter Height: As indicated on drawings.

4. Finish: Brushed, satin.

5. Mounting: Standoffs as indicated on the drawings.

2.6 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

Section 10 21 13.19 - Plastic Toilet Compartments

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

1.2 REFERENCE STANDARDS

A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.

D. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.4 WARRANTIES

A. Provide manufacturer’s 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Scranton Products, Hiny Hiders: www.scrantonproducts.com.

1. Accurate Partitions Corp (ASI Group): www.accuratepartitions.com.
2. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
3. General Partitions Mfg. Corp: www.generalpartitions.com.
4. Global Steel Products Corp (ASI Group): www.globalpartitions.com.
5. Hadrian: www.hadrian-inc.com.
6. Metpar Corp: www.metpar.com/#sle.
7. Partition Systems International of South Carolina: www.psisc.com/#sle.
8. Scranton Products: www.scrantonproducts.com/#sle.
9. Substitutions: Not permitted.

2.2 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested according to NFPA 286; floor-mounted headrail-braced.

1. Color: Single color as selected from the manufacturers full range of colors, available color options shall be equivalent to those provided by manufacturer indicated as Basis of Design.

B. Doors:

1. Thickness: 1 inch.
2. Width: 24 inch.

3. Width for Ambulatory Use: 32 inch, out-swinging and self-closing.

4. Width for Handicapped Use: 36 inch, out-swinging.

5. Height: 60 inch.

C. Panels:

1. Thickness: 1 inch.

2. Height: 60 inch.

D. Pilasters:

1. Thickness: 1 inch.

2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

F. Urinal Screens: Wall mounted with continuous satin stainless steel or aluminum angle brackets each side; through bolt with tamper proof type fasteners.

G. Crossbracing for ceiling-hung partitions: Provide crossbracing of the same materials as other panel components, minimum 4 inch tall, fastened at interior side of partitions. Install crossbracing.

2.3 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.

B. Head Rails: Extruded aluminum, anti-grip profile.

1. In addition to above partition doors and pilasters provide head rails above partition end walls and any open perimeter edge of the partitions.

C. Wall and Pilaster Brackets: Satin stainless steel or aluminum; continuous type.

D. Strikes: Continuous type, aluminum.

E. Latches: Aluminum or stainless steel.

F. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

2. Attach all components to solid blocking or structural substrate.

G. Hardware: Satin stainless steel:

1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

a. Wrap-Around Hinges: 8 inches and fabricated from heavy-duty extruded aluminum. Hinges are through-bolted to pilasters and doors with stainless steel tamper resistant Torx head sex bolts. Hinges operate with field adjustable nylon cams. Cams can be field set in 30, 60 or 90 degree increments.

2. Door Latch: Slide type .

3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.

4. Coat hook with rubber bumper; one per compartment, mounted on door.

5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions rigid, straight, plumb, and level manor, with plastic laid out as shown on shop drawings and manufacturer's installation instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

Section 10 26 00 - Wall and Door Protection

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Protective wall covering.

1.2 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, and anchorage details.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

1. Submit two samples of protective wall covering, 6 by 6 inches square.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.4 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a three year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Protective Wall Covering:

1. Basis of Design: Microban; refer to schedule on the drawings.
2. Babcock-Davis: www.babcockdavis.com.
3. Construction Specialties, Inc: www.c-sgroup.com/#sle.
4. Inpro: www.inprocorp.com/#sle.
5. Pawling Corp: www.pawling.com/#sle.
6. WallGuard.com: www.wallguard.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PRODUCT TYPES

A. Protective Wall Covering/Sheets:

1. Material: High-impact acrylic-modified vinyl sheets.
2. Thickness: 0.060 inch.
3. Color: As scheduled.
4. Texture: Suede.
5. Mounting: Adhesive.

B. Adhesives and Primers: As recommended by manufacturer.

C. See Section 09 21 16 for supports in stud wall construction.

2.3 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces for adhered items are clean and smooth.

B. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

A. Install components according to manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.

1. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.

2. Use a roller to ensure maximum contact with adhesive.

3.3 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.4 CLEANING

A. Clean wall protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

Section 10 28 00 - Toilet, Bath, and Laundry Accessories

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial toilet accessories.

B. Electric hand/hair dryers.

C. Changing stations.

1.2 REFERENCE STANDARDS

A. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

B. ASTM C1036 - Standard Specification for Flat Glass; 2021.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2018.

D. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Products listed are made by Bobrick: www.bobrick.com.

B. Commercial Toilet, Shower, and Bath Accessories:

1. AJW Architectural Products: www.ajw.com.
2. ASI - American Specialties, Inc: www.americanspecialties.com.
3. Bradley Corporation: www.bradleycorp.com.
4. Bobrick Washroom Equipment, Inc: www.bobrick.com.
5. Gamco USA: www.gamcousa.com.
6. Basco Incorporated: www.bascoinc.com.
7. Substitutions: Section 01 60 00 - Product Requirements.

C. Provide products of each category type by single manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, satin finished cast aluminum brackets, eccentric-shaped plastic spindle for 1/2 revolution delivery designed to prevent theft of tissue roll.

1. Products:

a. B-2740 manufactured by Bobrick.

B. Waste Receptacle: Recessed, stainless steel, seamless lower door for access to container, with tumbler lock, reinforced panel full height of door, continuously welded bottom pan and seamless exposed flanges.

1. Products:

a. B-3644 manufactured by Bobrick.

b. Substitutions: Section 01 60 00 - Product Requirements.

C. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal/vertical stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.

1. Minimum Capacity: 40 ounces.

2. Products:

a. B-2111 manufactured by Bobrick (vertical rectangular shape).

b. Substitutions: Section 01 60 00 - Product Requirements.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

1. Size: 24 by 36 inches.

2. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

3. Products:

a. B-165 2436 manufactured by Bobrick (mitered corners).

b. Substitutions: Section 01 60 00 - Product Requirements.

E. Grab Bars: Stainless steel, nonslip grasping surface.

1. Standard Duty Grab Bars:

a. Push/Pull Point Load: 250 pound-force, minimum.

b. Dimensions: 1 1/2 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.

c. Length and Configuration: As indicated on drawings.

d. Products:

(1) B-6806 Series manufactured by Bobrick.

(2) Substitutions: Section 01 60 00 - Product Requirements.

F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking panel with full-length stainless steel piano-type hinge, removable receptacle.

1. Products:

a. B-254 manufactured by Bobrick.

b. Substitutions: Section 01 60 00 - Product Requirements.

2.5 ELECTRIC HAND/HAIR DRYERS

A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle meeting Osha's current list of NRTLs standards.

1. Operation: Automatic, sensor-operated on and off.

2. Mounting: Surface mounted.

3. Cover: Stainless steel with brushed finish.

a. Tamper-resistant screw attachment of cover to mounting plate.

4. Air Velocity: 18,000 linear feet per minute, minimum, at full power.

5. Heater: 500 W, minimum, at full power.

6. Fan/Heater Control: Field adjustable down to approximately half-speed with corresponding reduction in heat output.

7. Total Wattage: 1400 W, maximum.

8. Runtime: Field adjustable or automatic, up to 35 seconds.

9. Wall Guard: Sloan 3366138-1; one at each dryer.

10. Electric Hand Dryer Products:

a. Excel Dryer Inc; XLERATOR: www.exceldryer.com/#sle.

(1) Provide UL Listed or an equivalent to Osha's current list of NRTLs standards for this or approved equivalent products for Archect/Engineer review and approval.

b. Substitutions: Section 01 60 00 - Product Requirements.

2.6 DIAPER CHANGING STATIONS

A. Adjustable Height Changing Station: Wall-mounted adjustable changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285 and Osha's current list of NRTLs standards.

1. Basis of Design: Koala Kare Products; Product KB3000-AHL.

a. Provide UL Listed or an equivalent to Osha's current list of NRTLs standards for this or approved equivalent products for Archect/Engineer review and approval.

2. Material: Stainless steel.

3. Mounting: Surface.

4. Color: Combination of Stainless Steel, Gray, and White.

5. Minimum Rated Load: 500 pounds.

6. Manufacturers:

a. Koala Kare Products: www.koalabear.com.

b. Max-Ability: www.max-ability.com.

c. Patient Safety USG: www.patientsafetyusa.com.

d. Substitutions: 01 60 00 - Product Requirements.

2.7 OTHER MISCELLANEOUS ROOM ACCESSORIES

A. Door Mounted Coat Hook:

1. Product: B-682 manufactured by Bobrick.

2. Location: Provide one hook at single use restroom doors and where indicated.

3. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

3.2 INSTALLATION

A. Install accessories according to manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.3 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

Section 10 44 00 - Fire Protection Specialties

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

1. Type A:B:C - Dry Chemical.

B. Fire extinguisher cabinets.

C. Accessories.

1.2 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.4 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:

1. Ansul, a Tyco Business; Sentry Extinguishers: www.ansul.com.

2. Activar Construction Products Group; JL Industries Cosmic Extinguishers: www.activarcpg.com.

3. Larsen's Manufacturing Co; Multi-Purpose Dry Chemical Extinguishers: www.larsensmfg.com.

4. Potter-Roemer; Product 3000 Series Extinguishers: www.potterroemer.com.

5. Nystrom.com; Product ABC Dry Chemical Fire Extinguishers: www.nystrom.com.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:

1. Activar Construction Products Group - JL Industries; Ambassador Series Cabinets: www.activarcpg.com/#sle.

2. Larsen's Manufacturing Co; Architectural Series Cabinets: www.larsensmfg.com.

3. Potter-Roemer; Alta Series Cabinets: www.potterroemer.com.

4. Nystrom; Product Alpine Series Extinguishers: www.nystrom.com.

5. Strike First Corporation of America; EL-Elite Architectural Series Fire Extinguisher Cabinet, Non-Fire Rated: www.strikefirstusa.com.

6. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.

1. Class: A:B:C type.

2. Sizes by Location Type:

a. For office type areas; 4A:80BC: 10 pound; travel 75 foot max.

b. For garage/shop/gym type areas; 20A:120BC: 20 pound; travel 50 foot max.

3. Finish: Baked polyester powder coat red color.

4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.3 FIRE EXTINGUISHER CABINETS

A. Metal: Cold rolled steel with powder-coat finish.

B. Cabinet Configuration: Semi-recessed type.

1. Size to accommodate accessories.

2. Projected Trim: Returned to wall surface, with approximately 2 1/2 to 4 1/2 inch projection, and rolled edge 2 inch wide face.

3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.

D. Door Elevation: "Vertical-Duo Panel" A tall, narrow window offset to the handle side.

E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

I. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

A. Extinguisher Bracket and Strap: Steel, with powder-coat paint, sized to fit extinguisher; finish to match extinguisher. J-Hooks are not acceptable, no exceptions.

B. Cabinet Signage: Fire Extinguisher.

C. Non-Cabinet Signage: Fire Extinguisher, 3-way; size and mounting according to applicable codes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 24 inches from finished floor to inside bottom of cabinet or as shown on the drawings.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

END OF SECTION

Section 10 51 13 - Metal Lockers

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal lockers.

B. Matching bases.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and nailers.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

D. Samples: Submit two samples 3 by 6 inches in size showing color and finish of metal locker material.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Vanguard Knocked Down Metal Storage Lockers by Penco.

1. Provide standard options, metal gages, and as noted herein.

2. Lockers provided by other approved manufacturers shall be equivalent to Basis of Design.

3. Note: It is understood that metal gauges may vary by manufacturer based on each locker series design, however other manufacturer’s standard gauges for proposed lockers series shall not be decreased from their currently printed literature.

B. Metal Lockers:

1. Art Metal Products: www.artmetalproducts.com/#sle.

2. ASI Lockers: www.asistorage.com.

3. DeBourgh Mfg. Co.; Worley Lockers.

4. Elite Storage Products: www.elitestorageproducts.com.

5. General Storage Systems, Div. of North American Steel; Decor Tri-Lok.

6. Hallowell: www.hallowell-list.com.

7. Hadrain Inc.: www.hadrian-inc.com.

8. List Industries, Inc: www.listindustries.com/#sle.

9. Lyon Workspace Products: www.lyonworkspace.com/#sle.
10. Penco Products, Inc: www.pencoproducts.com/#sle.
11. Pinnacle Storage Products: www.pinnaclestorageproducts.com.
12. Republic Storage Systems Co: www.republicstorage.com/#sle.
13. Salsbury Industries: www.lockers.com.
14. Spacesaver: www.spacesaver.com.
15. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 LOCKER APPLICATIONS

A. Lockers: Metal lockers, wall mounted with matching closed base.
1. Size: As shown on the drawings.
2. Configuration: As shown on the drawings.
3. Fittings: Size and configuration as indicated on drawings.
a. Hat shelf.
b. Hooks: One double prong.
4. Ventilation: Louvers at top and bottom of door panel.
5. Locking: Classic III Multi-point latching with recessed handles per basis of design.
6. Provide sloped top.

B. Locker Benches: Stationary type; bench top of laminated maple; painted steel pedestals.
1. Accessibility: Comply with ICC A117.1 and ADA Standards.
a. Provide ADA bench, height and length, as indicated on the drawings.

2.3 METAL LOCKERS

A. Note: It is understood that metal gauges may vary by manufacturer based on each locker series design, however a manufacturer's standard gauges shall not be decreased from their currently printed literature. Body, frame, doors, trim, tops, bases, shall be equivalent to basis of design.

B. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
1. Where ends or sides are exposed, provide flush panel closures.
2. Color: To be selected by Architect.

C. Hinges: Continuous piano hinge with powder coat finish to match locker color.

D. Coat Hooks: Stainless steel or zinc-plated steel.

E. Number Plates: Provide oval or rectangular shaped aluminum plates as selected by the Owner.

F. Locks: Locking device supplied by Owner.

G. Provide ADA units where shown; if not shown, locate where directed by the Architect. ADA locker units shall include all options and accessories to meet ADA requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Place and secure lockers.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, sloped tops, and miscellaneous panels.

G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

3.2 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

Section 10 56 17 - Wall Mounted Standards and Shelving

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel shelf standards, brackets, and accessories.

B. Shelves.

C. Refer to drawings for locations and configurations.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking in walls for attachment of standards.

B. Section 09 21 16 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards.

1.3 REFERENCE STANDARDS

A. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade.

B. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Steel Shelf Standards and Brackets:

1. Knape & Vogt Manufacturing Company; 87™/187™ Series: www.knapeandvogt.com/#sle.

2. Schulte: www.schultestorage.com.

3. ClosetMaid: www.closetmaid.com.

4. Rubbermaid: www.rubbermaid.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 COMPONENTS

A. Steel Shelf Standards, Brackets, and Accessories:

1. Super-Duty Shelf Standards and Brackets: Single-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.

a. Acceptable Product: KV 87/187.

b. Load Capacity: Recommended by manufacturer for loading of 540 to 1,060 pounds per pair of standards.

c. Face Width: 5/8 inch, single slotted.

d. Material: 12 gage, 0.1046 inch sheet steel.

e. Lengths: As indicated on drawings.

f. Finish: Powder-coated, white; provide screws with matching heads.

g. Brackets: 12 gage, 0.1046 inch sheet steel, reinforced, locking into slots with molded nylon cam lock lever; size to suit shelves; same finish as standards.

h. Application: Use extra heavy duty standards at all locations.

i. Bracket Quantity: Provide one bracket for each 12 inches of standard length.

B. Shelving:

1. Laminate Faced Shelves: Particleboard or medium density fiberboard covered with high pressure decorative laminate on both sides.

a. Edge Finish: Matching laminate, all four edges.

b. Substrate Thickness: 3/4 inch, nominal.

c. Length: As indicated on drawings.

d. Laminate: NEMA LD 3 Type HGL.

e. Laminate Color and Pattern: As indicated on drawings.

f. Application: Use laminate faced shelves at all locations.

C. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions. Finish of exposed to view fasteners to match finish of standards and other components.

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

A. Install according to manufacturer's instructions.

B. Mount standards to solid backing capable of supporting intended loads.

C. Install brackets, shelving, and accessories.

D. Provide double sided foam tape between adjoining sections of aluminum shelving to maintain alignment where applicable.

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 12 24 00 - Window Shades

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior manual roller shades.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.

2. Do not install shades until final surface finishes and painting are complete.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.

G. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

K. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

L. Maintenance contracts.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades according to manufacturer's recommendations.

1.6 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:

1. Shade Hardware: One year.

2. Fabric: One year.

3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Interior Manually Operated Roller Shades:

1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.

2. Light Harvesting Shading Solutions, Inc: www.lightharvestingshading.com.

3. Lutron Electronics Co., Inc; Contract Roller Manual Roller Shades: www.lutron.com/#sle.

4. MechoShade Systems LLC; Mecho/7 System: www.mechoshade.com/#sle.

5. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROLLER SHADES

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.

2. Provide shade system that operates smoothly when shades are raised or lowered.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install according to manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.5 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

C. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.7 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION

Section 12 36 00 – Countertops

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.2 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework.

1.3 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

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. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

1. Indicate layout of countertop supports brackets at all locations. Include attachment details to walls and counters. Final bracket layout shall be subject to Architect approval.

2. For bracket layout unsupported spans of countertops shall not exceed 48 inches. Wall hung or cantilever spans shall resist a 50 lbs per square foot load and not deflect in excess of 1/4 inch in any span or portion thereof.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, according to requirements of local authorities having jurisdiction.

1.7 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 absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.

1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.

a. Manufacturers:

(1) Formica Corporation: www.formica.com.

(2) Lamin-Art, Inc.: www.laminart.com.

(3) Panolam Industries International, Inc; Nevamar Standard HPL: www.panolam.com/#sle.

(4) Panolam Industries International, Inc.\Pionite: www.pionitelaminates.com.

(5) Wilsonart: www.wilsonart.com.

(6) Arborite High Pressure Laminates: www.arborite.com/en.

(7) Substitutions: See Section 01 60 00 - Product Requirements.

b. Finish: Matte or suede, gloss rating of 5 to 20.

2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; as scheduled on the drawings.

3. Fabricate according to AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting self-supporting over structural members.

1. Flat Sheet Thickness: 3/4 inch, minimum.

2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

a. Manufacturers:

(1) Avonite Surfaces: www.avonitesurfaces.com.

(2) Dupont: www.corian.com.

(3) Formica Corporation: www.formica.com.

(4) Wilsonart: www.wilsonart.com.

(5) InPro Corporation: www.inprocorp.com.

(6) LG HI-Macs: www.lghimacsusa.com.

(7) Staron Surfaces: www.staron.com.

(8) Maxstone International, LLC: www.maxstoneusa.com.

(9) Substitutions: See Section 01 60 00 - Product Requirements.

b. Finish on Exposed Surfaces: Semi-gloss, gloss rating of 25 to 50.

c. Color and Pattern: As indicated on drawings.

3. Other Components Thickness: 1/2 inch, minimum.

4. Exposed Edge Treatment: Built up to minimum 1 1/2 inch thick; as scheduled on the drawings.

5. Back and End Splashes: Same sheet material, radiused top; minimum 4 inches high.

2.2 MATERIALS

A. Counter Support Brackets:

1. Counter support brackets unless noted otherwise shall be 1/8” steel, reversible brackets as manufactured by A&M Hardware, Inc., 2705 Mt. Joy Rd, Manheim, PA 17545. 888-647-0200, Fax 717-664-4582. www.aandmhardware.com.

2. Sizes shall be selected from the manufacturer's standards:

a. 24”x29” (Paint/Primer Finish Only)

b. 24”x24” (Paint/Primer Finish Only)

c. 18”x24” (Available in S.S.)

d. 15”x21” (Available in S.S.)

e. 12”x18” (Paint/Primer Finish Only)

f. 8”x12” (Available in S.S.)

g. 5"x8" (Paint/Primer Finish Only)

3. Brackets finish shall be standard texture powder coat in black, white, gray or almond.

a. To be selected by Architect.

4. Provide 8" Black Oak Park Bracket by Knape & Vogt Mfg Co Model 200OP BLK 8 at all locations indicted on the drawings.

5. Support counters at each end and in the center at a minimum; counter fabricated to determine final bracket quantity, spacing, and locations.

6. Other equivalent brackets are acceptable.

B. Concealed Counter Support Brackets:

1. Counter Support Brackets: Provide Concealed Brackets by A&M Hardware, Inc., 2705 Mt. Joy Rd, Manheim, PA 17545. 888-647-0200, Fax 717-664-4582: www.aandmhardware.com or equivalent.

2. Federal Brace: www.federalbrace.com or equivalent.

3. Bracket Length: Provide maximum allowed length at each location; brackets shall include upper extension at all location where wall extends above counter.

4. Bracket finish shall be standard texture powder coat in black, white, gray or almond.

5. Attachment Hardware: Manufacturers standard.

6. Other equivalent brackets are acceptable.

C. Counter Support Brackets with Skirt/Apron Support:

1. ADA Vanity Bracket by A&M Hardware, Inc, or equivalent.

2. Stone Pro ADA Compliant Countertop Support #3743 by Braxton-Bragg, Rakks EHV-Vanity Supports, or equivalent.

3. Federal Brace: www.federalbrace.com or equivalent.

a. Other equivalent brackets are acceptable.

4. Fasteners: Provide Flat head 1/4" - 20 thread with 4 mm hex drive connector bolts in chrome, black, or oil rubbed bronze. Color as selected by Architect.

D. Counter Support Brackets; Flat Brackets:

1. Centerline Brackets: Countertop Island Support Brackets.

2. Speed Brace Stealth & Stealth HD; and Panel Clips.

E. Steel Support Posts: Manufacturer's standard with factory finish and flush fasteners at base flange. Color and sheen as selected by the Architect from manufacturer's full range of factory applied finishes.

F. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

G. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.

2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

2. Height: 4 inches, unless otherwise indicated.

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.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

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

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Attach wood countertops using screws with minimum penetration into substrate board of 5/8 inch.

D. Seal the exposed front underside edge of plastic laminate countertops with clear solvent based polyurethane at all locations; or wrap with plastic laminate back to face of casework below.

E. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

Section 12 48 13 - Entrance Floor Mats and Frames

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Modular grid walk-off surfaces.

1.2 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions.

C. Shop Drawings: Indicate dimensions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Floor Mats:

1. OBEX Grid CutX by Milliken & Company: www.millikenfloors.com.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 MATS AND EDGING

A. Modular Grid:

1. 100% UV-Resistant PVC.

2. Size: As indicated on the drawings.

3. Thickness: 0.43 inches.

4. Color: As indicated on the drawings.

5. Construction: Tufted, Cut Pile.

6. Tufted Face Weight: 24 oz/yd squared.

7. Nominal Total Weight: 28.8 oz/ft squared.

8. Edging: OBEX Vinyl Edge Kit.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install walk-off surfaces and edging according to manufacturers instructions.

B. Install walk-off surface after cleaning of finish flooring.

END OF SECTION

41. Rest Area Building Plumbing, Item SPV.0060.12; Maintenance Building Plumbing, Item SPV.0060.16.

A Description

This item consists of the plumbing construction work for the Rest Area Building and Maintenance Building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Rest Area Building Plumbing and Maintenance Building Plumbing as each individual installation, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.12	Rest Area Building Plumbing	EACH
SPV.0060.16	Maintenance Building Plumbing	EACH

Payment is full compensation for furnishing all materials and equipment, and for supplying all labor, tools, equipment, and incidentals necessary to complete the work.

Section 22 00 10 - Basic Mechanical Plumbing Requirements

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic Mechanical Plumbing Requirements specifically applicable to Division 22 in addition to Division 1 - General Requirements.

1.2 SCOPE OF WORK

A. The Mechanical Plumbing Contract shall also include furnishing and installing a complete plumbing system for the new building and all other related work as called for under the specifications and shown on plans.

1.3 WORK INCLUDED

A. The Mechanical Plumbing Contract shall include all work under the listed Division 22 of the Specifications Index and all related Mechanical work as shown on the Drawings for the project.

B. A Complete table of Mechanical Reference Symbols is shown on the plans.

C. Under this Contract the Mechanical Contractor shall furnish the Owner with a PDF of all pertinent systems related documents stored on a soild state external hard drive or a single flash stick. Submit a single PDF to the Engineer for review. The Engineer will then turn information provided over to the Owner. The PDF shall contain the following items:

1. Shop drawings on all major equipment.
2. Operating Instructions for all major equipment.
3. Maintenance Instructions for all major equipment.
4. Wiring diagrams for all equipment.
5. Test and Balance Reports.
6. The Mechanical installation to be made under Division 23 is set up for contract bidding as follows:

a. Mechanical HVAC Contractor is a sub-contractor to the General Contractor.

(1) The Mechanical contractor is responsible for own equipment, such as cranes, lifts, etc. in order to provide a complete installation of mechanical systems.

(2) The Mechanical contractor shall be a sub-contractor to the General Contractor and shall include in the bid, prices from sub-contractors for control wiring, and other trades necessary to complete the entire job.

D. Under this Contract the Mechanical Contractor shall furnish the Owner with two 3-ring binders of all pertinent systems related documents. Submit manuals to the Engineer for review. The Engineer will then turn books over to the Owner. The books shall contain the following items:

1. Shop drawings on all major equipment.
2. Operating Instructions for all major equipment.
3. Maintenance Instructions for all major equipment.
4. Wiring diagrams for all equipment.
5. Test and Balance Reports.

E. The Mechanical Contractor is responsible for contacting the utility companies and coordinating the water, sewer and natural gas connections for the building service. Include all costs in bid.

F. The Mechanical installation to be made under Divisions 22 is set up for contract bidding as follows:

1. Mechanical Plumbing Contractor is a sub-contractor to the General Contractor.

a. The Mechanical contractor is responsible for own equipment, such as cranes, lifts, etc. in order to provide a complete installation of mechanical systems.

b. The Mechanical contractor shall be a sub-contractor to the General Contractor and shall include in the bid, prices from sub-contractors for control wiring, and other trades necessary to complete the entire job.

1.4 **SPECIFICATIONS COMPLIANCE**

A. The requirements of these specifications shall be complied with in every respect. Therefore, it shall be absolutely mandatory that the job foreman, all lead mechanics, subcontractors and their foreman have completely studied these specifications, be completely knowledgeable as to their entire contents, and maintain a copy at the job-site. Failure to comply with this requirement will be reason to presume the mechanic or subcontractor is not in responsible charge of their work due to ignorance of job requirements and will be reason for the owner to require dismissal and replacement with approved personnel. Every foreman and lead mechanic shall be provided with a complete copy of this specification.

1.5 **INCONSISTENCIES**

A. If there is an inconsistency in the quality and/or quantity of Work required by the Contract Documents, either the greater quality and/or quantity of Work indicated shall be provided according to the Engineer/Architect's interpretation without change in the contract sum.

1.6 WORK NOT INCLUDED

A. The following work is not included as part of the Contract.

1. The removal and storage of any equipment in the building required to be moved or relocated during the construction process.

1.7 CODES, FEES AND LATERAL COSTS

A. The Plumbing Installation shall meet all applicable local, state and federal codes and standards.

B. All permits necessary for a complete plumbing installation shall be paid for by this Contractor.

C. This contractor shall contact the local utilities for gas, water, sanitary and storm sewers, and include in their bid the any costs associated with service installation charges of the utility(s).

D. Except in those municipalities which provide state- approved electrical inspection, all installation of electrical equipment wiring shall be inspected by the State Board of Electricity. Allowance shall be made in the bid and contract for the cost of such inspection.

1. Fees for such inspection will be charged according to the rules and regulations of the State Board of Electricity. Evidence of payment of fees shall be provided by the Contractor with the Request for Payment.

1.8 REFERENCES

A. All equipment, piping, etc., shall be new and shall be installed to meet the approval of the following additional ordinances: ASME Rules for Pressure Tanks, National Board of Fire Underwriter's Rules, American Waterworks and the American Gas Association.

1.9 SUBMITTALS

A. Submit under provisions of Division 01 3000.

B. Products Scheduled on the Drawings by Naming one Manufacturer, but not Indicating Other Approved Manufactures in the Specifications: Use any equivalent product complying with the specifications in general and equivalent to the “Basis of Design” identified in the drawing’s schedules. Pre-bid substitutions are not required in this situation.

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. All documents shall be submitted in .pdf format unless pre-approved by Engineer.

E. The contractor shall not use any equipment or materials that does not have the engineer’s stamped approval.

F. Mark dimensions and values in units to match those specified.

1.10 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

1.11 SEQUENCING AND SCHEDULING

A. Construct Work in sequence under provisions of Division 1.

1.12 PRE-CONSTRUCTION COORDINATION AND VERIFICATION

A. This Contractor shall coordinate their work with other Contractors on this job. Any conflict which cannot be resolved shall be settled by the Architect/Engineer.

B. Field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions.

C. The Contractors shall check architectural, structural, plumbing, heating, ventilating and electrical plans to avert possible installation conflicts. Should drastic changes from original plans be necessary to resolve such conflicts this Contractor shall notify the Architect/Engineer and secure written approval and agreement on necessary adjustments before the installation is started.

D. Discrepancies shown on different plans or between plans and actual field conditions or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision.

E. The Contractor shall consider and review the complete set of documents, etc., Architectural, Structural, Mechanical, Electrical, etc., (Drawings and Specifications) as a complete set. They will be responsible for any and all mechanical work shown or stated (to be by the contractor), to include this work in the bid and install such items even though they are not specifically shown or stated on the Mechanical section of the plans and specifications.

1.13 **COORDINATION**

A. Contractor shall be responsible for continual coordination of the mechanical work with other trades so as to avoid conflicts in installation. Contractor shall cooperate with other trades to assure that construction proceeds in an orderly and timely manner.

B. Study the civil, structural, electrical, shop and any specialty drawings and specifications to determine required coordination.

1. Anchor bolts, sleeves, inserts and supports that may be required for the mechanical work shall be furnished and installed under the same division of the specifications as the respective items to be supported. Excluded from this requirement are cast in place anchor bolts.

2. Slots, chases, openings and recesses through floors and walls as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located in zones provided or otherwise approved by the Engineer or Architect and/or Owner.

3. Locations of pipes, panels, equipment, fixtures, etc., shall be adjusted to accommodate interferences encountered. The Project Coordinator shall determine the exact rerouting and location of each pipe and/or duct encountered prior to fabrication.

   a. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.

   b. Offsets, transitions and changes in direction in pipes shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings.

4. Installation of Arrangement: The contractor shall install all mechanical work to permit removal of, and access to, (without damage to other parts) all parts requiring periodic replacement or maintenance.

C. Contractor to expose and verify location and elevation of existing sewer prior to laying any pipe to or from connection points when connecting to existing or proposed sewer. If location or elevation of existing sewer does not match location and elevation indicated on drawings, notify engineer immediately, at which time the engineer may adjust proposed alignments and elevations. Allow reasonable amount of time for engineer to make assessment of conditions and determine alternate means of construction if necessary. As a minimum, engineer shall be allowed one working day from the time of notification to make assessment and determination of alternate work without submittal of Change Proposal for adjustment to Contract Price or Contract Times.

D. Layout Priority:

1. All trades shall understand that other trades will need to work in the same areas during the project. All final decisions as to the right-of-way and runs of utility lines (pipes, ducts, etc.) shall be made by Owner and/or Architect. In general, priority shall be given as follows:

   a. Process piping which must be drainable

   b. Sheet metal ductwork

   c. Light Fixtures

   d. Plumbing waste lines, downspouts, and vents

   e. Sprinkler piping

   f. Gravity water lines

   g. Ice water or steam lines

   h. Refrigerant lines

   i. Gas and air lines

   j. Plumbing water

   k. Electrical conduit

   l. Control air lines

E. PREPARE DETAILED SHOP DRAWINGS WHERE NECESSARY TO ASSURE PROPER FIT AND NECESSARY CLEARANCE.

1.14 CUTTING, PATCHING AND FIRESTOPPING

A. The Plumbing Contractor shall set all sleeves in construction for their Work.

B. Where cutting is required, it shall be done by the Plumbing Contractor.

C. All patching shall be done by Plumbing Contractor.

D. All cutting of any kind must be done with great care so as not to leave unsightly surfaces which may not be entirely concealed by plates, escutcheons, or their normal concealing construction, if such unsightly conditions occur, Plumbing Contractor will be required, at their own expense, to replace the damaged construction.

E. This Plumbing Contractor shall provide and install firestopping materials per Section 07 8400 - Firestopping.

1.15 **ACCESS PANELS REQUIRED BY TRADE**

A. Trade requiring access shall provide and install access panels where not shown or specified.

B. The finished appearance and function will be subject to approval by the Architect/Owner.

C. Provide panels that accommodate adjacent finishes in finished spaces.

D. Access panels shall meet all code requirements for each location they are installed and shall be sized appropriately.

1.16 ELECTRICAL

A. Electrical Contractor shall furnish all motor starters and motor controls and provide all wiring for motor control operation, except if specified otherwise.

1.17 ADDITIONAL ELECTRICAL COSTS

A. If the Mechanical Contractor substitutes equipment for specified units, the mechanical contractor shall be responsible for any additional electrical installation costs for this substitution whether the other equipment was listed as equal in the specification or was approved equal after the project was in the bidding process.

1.18 GUARANTEE

A. This Contractor shall be responsible for the proper installation and working of everything in this contract and shall guarantee to remedy free of charge any defects in workmanship and materials that may appear to give or gives rise to trouble of any kind for a period of one year from date of final substantial completion.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

Section 22 05 19 - Meters and Gauges for Plumbing Piping

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.2 REFERENCE STANDARDS

A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).

B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

A. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

2.2 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

2.3 DIAL THERMOMETERS

A. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.

1. Size: 5 inch diameter dial.

2. Accuracy: 1 percent.

3. Calibration: Degrees F.

2.4 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.5 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples and siphons to allow clearance from insulation. Provide siphon on gauges in steam systems.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Provide instruments with scale ranges selected according to service with largest appropriate scale.

F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

H. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

Section 22 05 53 - Identification for Plumbing Piping and Equipment

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Piping: Pipe markers.

B. Pumps: Nameplates.

C. Small-sized Equipment: Tags.

D. Tanks: Nameplates.

E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc.: www.pipemarker.com/#sle.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Brimar Industries, Inc.: www.pipemarker.com.
4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
5. Seton Identification Products: www.seton.com.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.

2. Brimar Industries, Inc: www.pipemarker.com.

3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.

4. MIFAB, Inc: www.mifab.com.

5. Seton Identification Products: www.seton.com.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

2.5 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. Plumbing Valves: Green.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers according to manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe according to manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Section 22 07 19 - Plumbing Piping Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 REFERENCE STANDARDS

A. Applicable State Plumbing Code with Amendments

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2019).

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

I. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

K. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

L. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

M. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

N. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.

O. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2022.

P. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).

Q. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

R. ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation; 2017 (Reapproved 2023).

S. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service; 2022.

T. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.

U. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

V. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

W. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

B. Protect insulation from weather and sunlight, construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested according to ASTM E84 or UL 723.

2.2 GLASS FIBER

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.

2. Maximum Service Temperature: 850 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested according to ASTM E96/E96M of 0.02 perm-inches.

C. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature:

a. 1 inch and below = 220F

b. 1.5 and 2" = 300F

3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.4 JACKETS

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested according to ASTM E96/E96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Install according to North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

1. Armaflex Fabricated Fittings: Pre-fabricated insulation elbows, tees, and fabricated covers for grooved fittings and couplings to reduce complex cutting and assembly of insulation in the field. Provides complete system integrity for thermal performance and controlling condensation drip from below-ambient systems when used as part of an Armaflex pipe insulation system. UL GREENGUARD Gold Certified for low VOC’s and includes Microban® antimicrobial protection from the growth of mold and mildew in the system.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert Location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

6. ArmaFix EcoLight Pipe Supports: Pipe supports with a load-bearing PET core to support and protect the insulation from crushing or damage, maintaining the thermal integrity of the system and preventing thermal bridging. Armacell insulation is located on the outer part for connection to Armacell's Armaflex insulations. Matches all wall thickness and ID dimensions of Armacell's tube insulation offerings.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces below 10 feet and below: Finish with PVC jacket and fitting covers.

L. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

END OF SECTION

Section 22 10 05 - Plumbing Piping

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.

1. Sanitary sewer.
2. Domestic water.
3. Equipment drains and overflows.
4. Flanges, unions, and couplings.
5. Pipe hangers and supports.
6. Valves.
7. Relief valves.
8. Strainers.

1.2 RELATED REQUIREMENTS

A. Section 31 2316 - Excavation.

B. Section 31 2323 - Fill.

C. Section 31 2316.13 - Trenching.

D. Section 33 1300 - Disinfecting of Water Utility Distribution.

E. Section 07 84 00 - Firestopping.

F. Section 08 31 00 - Access Doors and Panels.

G. Section 09 91 23 - Interior Painting.

H. Section 22 07 19 - Plumbing Piping Insulation.

I. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

J. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. Applicable State Plumbing Code with Amendments

B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.

E. ASME B31.1 - Power Piping; 2022.

F. ASME B31.9 - Building Services Piping; 2020.

G. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

I. ASSE 1003 - Water Pressure Reducing Valves for Potable Water Distribution Systems; 2023.

J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

K. ASTM B32 - Standard Specification for Solder Metal; 2020.

L. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

O. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

T. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

U. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

V. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2023.

W. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

X. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

Y. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; 2017.

Z. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

AA. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

BB. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

CC. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

DD. MSS SP-67 - Butterfly Valves; 2022.

EE. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

FF. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

GG. NSF 61 - Drinking Water System Components - Health Effects; 2023.

HH. NSF 372 - Drinking Water System Components - Lead Content; 2022.

II. ASTM F 2389-06 - Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems

JJ. CSA B137.11 - Polypropylene (PP-R) Pipe and Fittings for Pressure Applications

KK. NSF/ANSI 14 - Plastic Piping System Components and Related Materials

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Project Record Documents: Record actual locations of valves.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

A. Perform work according to applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified according to ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

1.8 EXTRA MATERIALS

A. See Section 01 6000 - Project Requirements, for additional provisions.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Drain, Waste and Vent Systems:

1. PVC piping and fittings shall be installed per IAPMO IS 9-2018.

2. Cast Iron piping and fittings shall be installed per IAPMO IS 6-2018.

2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

3. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF international.

B. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

3. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF international.

B. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

3. Not Allowed in Return Air Plenums.

2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints: ASTM B 32, alloy Sn95 solder.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or gray iron, standard thickness.

2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

C. Pipe and Fitting Identification:

1. The pipe shall be marked according to the standards to which it is manufactured.

a. Color identification by the use of stripes on pipe to identify pipe service shall be optional. If used, stripes or colored exterior pipe product shall be blue for potable water, green for wastewater/sewage, or purple for reclaimed water.

b. Tracing wire shall be placed parallel and 18 inches above, but separate from, the pipe and shall be 10 AWG.

2.5 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.6 EQUIPMENT DRAIN & OVERFLOW

A. Copper Tube: ASTM B306, DWV.

1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.

2. Joints: ASTM B32, alloy Sn50 solder.

B. PVC Pipe: ASTM D2665.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.
3. Not Allowed in Return Air Plenums.

2.7 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.
5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.

3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.

6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.

7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.

8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

11. Vertical Support: Steel riser clamp.

12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.

15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.9 BALL VALVES

A. Manufacturers:

1. Apollo Valves: www.apollovalves.com/#sle.

2. Grinnell Products, a Tyco Business: www.grinnell.com.

3. Conbraco Industries: www.apollovalves.com.

4. Milwaukee Valve Company: www.milwaukeevalve.com.

5. Nibco, Inc: www.nibco.com.

6. Uponor, Inc: www.uponorengineering.com/sle.

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.10 **PLUG VALVES**

A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

B. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.11 **SPRING CHECK VALVES**

A. Manufacturers:

1. Grinnell Products, a Tyco Business: www.grinnell.com.
2. Conbraco Industries: www.apollovalves.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Nibco, Inc: www.nibco.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction, 2 inches and smaller: MSS SP-80, ANSI 372 certified, 300 psig WOG, bronze body and disc, stainless steel lever and pin with threaded connections.

C. Construction, 2.5 inches and greater: MSS SP-71, contains less than 0.25% of lead by weight, 125 psi SWP, 3% nickel/iron body, stainless steel trim and flanged connections.

2.12 **GLOBE VALVES**

A. Manufacturers:

1. Grinnell Products, a Tyco Business: www.grinnell.com.
2. Conbraco Industries: www.apollovalves.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.
4. Nibco, Inc: www.nibco.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: 2 inches and smaller: MSS SP-80, ANSI 372 certified, 300 psig WOG, bronze body and disc, brass stem and disc ring, iron handwheel and threaded connections.

2.13 BUTTERFLY VALVES

A. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.14 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com/#sle.
2. Watts Regulator Company: www.wattsregulator.com/#sle.
3. Victaulic :www.victaulic.com
4. Bermad : www. bermad.com
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 2 Inches:

1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Over 2 Inches:

1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.15 RELIEF VALVES

A. Temperature and Pressure Relief:

1. Manufacturers:

a. Cla-Val Co: www.cla-val.com.

b. Henry Technologies: www.henrytech.com.

c. Watts Regulator Company: www.wattsregulator.com.

d. Bell & Gossett: www.xylem.com

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labeled.

B. Temperature and Pressure:

1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

2.16 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.

2. Green Country Filter Manufacturing: www.greencountryfilter.com.

3. WEAMCO: www.weamco.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Under:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install according to manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

1. Coordinate size and location of access doors with Section 08 31 00.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Provide support for utility meters according to requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

1. Painting of interior plumbing systems and components is specified in Section 09 91 23.

2. Painting of exterior plumbing systems and components is specified in Section 09 91 13.

3. All metals that are not resistant to corrosion shall be painted per section 09 9000.

L. This contractor shall be responsible for removing all spoils from excavation and trenching from the site.

M. All below grade plumbing piping shall be installed on a 3” minimum pea-rock base.

N. All below grade plumbing piping shall be buried in pea-rock with a 4” minimum cover.

O. All trenches above the pea-rock shall be backfilled with select granular fill up to the sand base. Select granular fill shall have a maximum aggregate size of 2”, with a maximum of 10% on a 200 sieve. Trenches shall be compacted to 98% proctor density. General Contractor shall finish final grade.

P. Pipe vents from gas pressure reducing valves to outdoors.

Q. Install water piping to ASME B31.9.

R. Copper Pipe and Tube: Make soldered joints according to ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

S. PVC Pipe: Make solvent-welded joints according to ASTM D2855.

T. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

U. Pipe Hangers and Supports:

1. Install according to ASME B31.9.

2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

3. Place hangers within 12 inches of each horizontal elbow.

4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

7. Provide copper plated hangers and supports for copper piping.

8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide plug valves in natural gas systems for shut-off service.

I. Provide flow controls in water recirculating systems where indicated.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system according to Section 33 01 10.58.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze according to AWWA C651.

3.7 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer, pressure reducing valve, and sand strainer.

1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

2. Provide 18 gage, 0.0478 inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 2 psi. Provide regulators on each line serving gravity type appliances, sized according to equipment.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

TABLE 313.1
HANGERS AND SUPPORTS

MATERIALS	TYPES OF JOINTS	HORIZONTAL	VERTICAL
Cast	Lead and Oakum	5 feet, except 10 feet where 10 foot lengths are installed[1, 2, 3]	Base and each floor, not to exceed 15 feet
	Compression Gasket	Every other joint, unless over 4 feet then support each joint[1, 2, 3]	Base and each floor, not to exceed 15 feet
Cast-Iron Hubless	Shielded Coupling	Every other joint, unless over 4 feet then support each joint[1,2,3,4]	Base and each floor, not to exceed 15 feet
Copper Tube and Pipe	Soldered or Brazed	1½ inches and smaller, 6 feet; 2 inches and larger, 10 feet	Each floor, not to exceed 10 feet[5]
Steel and Brass Pipe for Water or DWV	Threaded or Welded	¾ inch and smaller, 10 feet; 1 inch and larger, 12 feet	Every other floor, not to exceed 25 feet[5]
Steel, Brass, and Tinned Copper Pipe for Gas	Threaded or Welded	½ inch, 6 feet; ¾ inch and 1 inch, 8 feet; 1¼ inches and larger, 10 feet	½ inch, 6 feet; ¾ inch and 1 inch, 8 feet; 1¼ inches every floor level
Schedule 40 PVC and ABS DWV	Solvent Cemented	All sizes, 4 feet; allow for expansion every 30 feet[3,6]	Base and each floor; provide mid-story guides; provide for expansion every 30 feet[6]
CPVC	Solvent Cemented	1 inch and smaller, 3 feet; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides[6]
Lead	Wiped or Burned	Continuous Support	Not to exceed 4 feet
Copper	Mechanical	In accordance with standards acceptable to the Authority Having Jurisdiction	
Steel and Brass	Mechanical	In accordance with standards acceptable to the Authority Having Jurisdiction	
PEX	Cold Expansion, Insert and Compression	1 inch and smaller, 32 inches; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides
PEX-AL-PEX	Metal Insert and Metal Compression	½ inch, ¾ inch, 1 inch: All sizes 98 inches	Base and each floor; provide mid-story guides
PE-AL-PE	Metal Insert and Metal Compression	½ inch, ¾ inch, 1 inch: All sizes 98 inches	Base and each floor; provide mid-story guides
Polypropylene (PP)	Fusion weld (socket, butt, saddle, electrofusion), threaded (metal threads only), or mechanical	1 inch and smaller, 32 inches; 1¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides

For SI units: 1 inch = 25.4 mm, 1 foot = 304.8 mm

Notes:

1 Support adjacent to joint, not to exceed 18 inches (457 mm).

2 Brace not to exceed 40 foot (12 192 mm) intervals to prevent horizontal movement.

3 Support at each horizontal branch connection.

4 Hangers shall not be placed on the coupling.

5 Vertical water lines shall be permitted to be supported in accordance with recognized engineering principles with regard to expansion and contraction, where first approved by the Authority Having Jurisdiction.

6 See the appropriate IAPMO Installation Standard for expansion and other special requirements.

END OF SECTION

Section 22 10 06 - Plumbing Piping Specialties

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hydrants.

D. Washing machine boxes and valves.

E. Refrigerator valve and recessed box.

F. Backflow preventers.

G. Vacuum Breakers

H. Circuit Solvers

I. Water hammer arrestors.

J. Sanitary waste interceptors.

K. Mixing valves.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

B. Section 22 30 00 - Plumbing Equipment.

C. Section 22 40 00 - Plumbing Fixtures.

D. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. Applicable State Plumbing Code with Amendments

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ASME A112.6.3 - Floor Drains; 2022.

D. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.

E. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

F. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

G. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

H. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016).

I. NSF 61 - Drinking Water System Components - Health Effects; 2023.

J. NSF 372 - Drinking Water System Components - Lead Content; 2022.

K. PDI-WH 201 - Water Hammer Arresters; 2017.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Operation Data: Indicate frequency of treatment required for interceptors.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Watts Regulator Company: www.watts.com
5. Wade: www.wadedrains.com
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Linear Drains:

1. Body: Provide stainless-steel with sloped channel to vertical waste pipe.
2. Clamping Ring: Stainless steel mechanism to clamp waterproof membrane to linear drain body.
3. Grate: Slotted.

C. Floor Drains:

1. Assembly: ASME A112.6.3
2. Body: ASME A112.6.3; light duty lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.
3. Strainer: adjustable round, nickel bronze strainer
4. Accessories:
    a. Removable perforated sediment bucket.
    b. Floor Drain Trap Seals
        (1) Description: Push-fit EPDM or silicone fitting with a one-way membrane.

2.3 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.

3. Zurn Industries, LLC: www.zurn.com.

4. Watts Regulator Company: www.watts.com

5. Wade: www.wadedrains.com

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cleanouts at Interior Finished Floor Areas (FCO-1):

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

C. Cleanouts at Interior Finished Wall Areas (WCO-1):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2. Zurn CO-2411-PV Line type plastic cleanout that fits flush inside sce. 40DWV pipe with brass threaded insert. Provide with Zurn CO-2530-SS stainless steel round access cover

2.4 HYDRANTS

A. Manufacturers:

1. Woodford:www.woodfordmfg.com

2. Arrowhead Brass & Plumbing, LLC: www.arrowheadbrass.com.

3. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

4. Zurn Industries, LLC: www.zurn.com.

B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome-plated lockable recessed box hose thread spout, lockshield and removable key, and integral ASSE 1052 double check backflow preventer. Hardened stainless steel operating stem and one-piece valve plunger to control both flow and drain functions. Wall thickness to be as corresponds to associated wall thickness

2.5 WASHING MACHINE BOXES AND VALVES

A. Box Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.

2. Oatey Supply Chain Services, Inc: www.oatey.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Valve Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.

2. Zurn Industries, LLC: www.zurn.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

C. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.

2.6 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.

2. Oatey Supply Chain Services, Inc: www.oatey.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Valve Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.

2. Zurn Industries, LLC: www.zurn.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

C. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.7 BACKFLOW PREVENTERS

A. Manufacturers:

1. Conbraco Industries, Inc: www.apollovalves.com.

2. Watts Regulator Company : www.watts.com.

3. Zurn Industries, LLC: www.zurn.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reduced Pressure Backflow Preventers:

1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.8 **PRESSURE VACUUM BREAKERS**

A. Manufacturers:

1. Watts: www.watts.com

2. Zurn Industries, LLC : www.zurn.com

3. Substitutions: See Section 01 6000 - Product Requirements.

B. Description:

1. Lead free, cast copper silicon alloy anti-siphon pressure vacuum breaker with replaceable plastic seat, o-ring bonnet and test cocks.

2. Must be installed 12" above highest point of downstream piping.

2.9 CIRCUIT SOLVER

A. Furnish and install CIRCUIT SOLVER as indicated on the plans. CIRCUIT SOLVER shall be self-contained and fully automatic without additional piping or control mechanisms. Valve shall be a CIRCUIT SOLVER as manufactured by Therm-Omega-Tech, Inc., or equivalent.

1. CIRCUIT SOLVER shall regulate the flow of recirculated domestic hot water based on water temperature entering the CIRCUIT SOLVER regardless of system operating pressure.

a. Even when fully closed the CIRCUIT SOLVER shall bypass a small amount hot water to maintain dynamic control of the recirculating loop.

b. CIRCUIT SOLVER shall be factory adjustable as required by project conditions.

c. CIRCUIT SOLVER shall be available in sizes ranging from ½ inch NPT to 2” NPT.

B. CIRCUIT SOLVER body and all internal components shall be constructed of stainless steel with major components constructed of type 303 stainless steel.

1. CIRCUIT SOLVER sizes ½ inch through 2 inch shall be rated to 200 PSIG maximum working pressure.

a. All CIRCUIT SOLVER shall be standard tapered female pipe thread, NPT.

2. All CIRCUIT SOLVER shall be rated to 300° F (148.9°C) maximum working temperature.

3. All CIRCUIT SOLVER shall be NSF-61 certified for use in all domestic water systems.

4. Thermal actuator shall be spring loaded and self-cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits

C. Accessories

1. Shut-off Valve on both side for service

2. Union

2.10 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

2. Watts Regulator Company : www.watts.com.

3. Zurn Industries, LLC: www.zurn.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized according to PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.11 SANITARY WASTE INTERCEPTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.

2. MIFAB, Inc: www.mifab.com/#sle.

3. Zurn Industries, LLC: www.zurn.com/#sle.

4. Striem.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Sand Oil Interceptors:

1. Construction:

a. Material: POLYETHYLENE.

b. Rough-in: Fully recessed (shallow rough-in) with anchor flange.

c. Accessories: Integral deep seal trap, removable integral flow control, adjustable draw-off assembly, sediment bucket.

d. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.

2.12 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:

a. Conbraco Industries: www.conbraco.com.

b. Watts Regulator Company: www.wattsregulator.com.

c. Zurn Industries, Inc: www.zurn.com.

d. Lawler Manufacturing Co.:www.temperedwater.com

e. Bradley Corp: www.bradleycorp.com

f. ____.

g. Substitutions: See Section 01 60 00 - Product Requirements.

2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

3. Accessories:

a. Check valve on inlets.

b. Volume control shut-off valve on outlet.

c. Stem thermometer on outlet.

d. Strainer stop checks on inlets.

4. Cabinet: 16 gage, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

2.13 AIR VENTS

A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

E. Pipe relief from backflow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or _____.

G. Install Circuit Solver in each domestic hot water return piping branch beyond last hot water devide in that branch as shoen on plans.

1. Provide suitable access panel as required in non-accessible ceilings and walls.

END OF SECTION

Section 22 30 00 - Plumbing Equipment

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial Heat Pump water heater.

B. Commercial electric water heaters.

C. Domestic hot water storage tanks.

D. Diaphragm-type compression tanks.

E. Domestic Water Treatment

F. In-line circulator pumps.

1.2 RELATED REQUIREMENTS

A. Section 25 15 00 - Integrated Automation Software.

B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data:

1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.

2. Indicate pump type, capacity, power requirements.

3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

4. Provide electrical characteristics and connection requirements.

C. Shop Drawings:

1. Indicate heat exchanger dimensions, size of tappings, and performance data.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters and heat exchangers.

PART 2 PRODUCTS

2.1 WATER HEATERS

A. Manufacturers:

1. A.O. Smith Water Products Co: www.hotwater.com/#sle.
2. Bock Water Heaters, Inc: www.bockwaterheaters.com/#sle.
3. Rheem Manufacturing Company: www.rheem.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Commercial Heat Pump Water Heaters:

1. The heat pump shall have a scroll compressor, factory charged with R134 refrigerant, NSF61 approved stainless steel circulator pump, and double wall stainless steel condenser for potable water applications. The complete heat pump assembly shall carry a one (1) year limited warranty, shall have a factory coated evaporator coil, and shall be equipped with a stainless-steel single wall heat exchanger evaporator.
2. The refrigerant circuit shall contain an adjustable thermal expansion valve, receiver, accumulator, serviceable drier and service port for refrigerant gauges.
3. CSA C22.2 No. 236:2015, UL 1995:2015-07 standards
4. Construced with heavy gauge aluminum jacket assembly and painted on both sides.
5. Equipped with terminal strips for controls connection. A low voltage connection board connection points for safety and operating controls, i.e., Alarm Contacts, Runtime Contacts and Tank Thermostat, A high voltage terminal strip shall be provided for Supply voltage. Supply voltage shall be 208-230V/1PH/60Hz
6. Equipped with low and high refrigerant pressure switches; short cycle control; outlet water temperature sensor and return water temperature sensor
7. Rated for up to 50% polypropylene glycol.

C. Commercial Electric Water Heaters:

1. Type: Factory-assembled and wired, electric, vertical storage.
2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
3. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
4. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
5. Accessories:
    a. Water Connections: Brass.
    b. Dip Tube: Brass.
    c. Drain valve.
    d. Anode: Magnesium.
    e. Temperature and Pressure Relief Valve: ASME labeled.

6. Controls: Ventilated control cabinet, factory-wired with solid state progressive sequencing step controller, fuses, magnetic contactors, control transformer, pilot lights indicating main power and heating steps, control circuit toggle switch, electronic low-water (probe-type) cut-off, high temperature limit thermostat, flush-mounted temperature and pressure gauges.

7. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in.

2.2 DOMESTIC HOT WATER STORAGE TANKS

A. Manufacturers:

1. American Wheatley, a company of Global Flow Products, LLC: www.wheatleyhvac.com/#sle.

2. A.O. Smith Water Products Co: www.hotwater.com/#sle.

3. Bock Water Heaters, Inc: www.bockwaterheaters.com/#sle.

4. Bradford White Corporation; Jacketed Storage Tank: www.bradfordwhite.com/#sle.

5. Wessels Company: www.westank.com/#sle.

6. Lochinvar.

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Tank: Welded steel, ASME labeled for working pressure of 125 psig, steel support saddles, tappings for accessories, glass-lined, threaded connections of stainless steel, access manhole.

C. Insulation: 2 inch thick, non-cfc foam on respective top and tank sides.

D. Openings: Up to 3 inches, copper-silicone threaded; over 4 inches, flanged; flanged collar for heat exchanger; manway fitting.

E. Accessories: Provide aquastat, backflow preventer, drain valve, pressure-temperature (PT) relief valve ASME rated for maximum working pressure, and thermometer with range of 40 to 200 degrees F.

2.3 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel, tested and stamped according to ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.4 DOMESTIC WATER TREATMENT

A. Basis of Design: Lync AquaSolve

1. See Section 01 3000-Administrative Requirements for submittal and substitution procedures.

B. Furnish a pre-packaged commercial water quality scale prevention, sediment filtration, and UV disinfection package as specified here in this section and as called for in the equipment schedule for the reduction of scale formation and sediment as well as for the disinfection of water. The anti-scale packaged system shall be supplied complete and pre-assembled entirely by one manufacturer. The construction of the packaged system shall include commercial Lync AquaSolve® scale prevention systems, Lync ultraviolet disinfection systems, and a Lync cartridge filter system.

C. Feedwater Requirements

1. The system shall be suitable for operation and capable of all flow and dosage claims when operated on a water supply with the following parameters:

Maximum Hardness	30 Grains (120 mg/L as CaCO3)
Water Pressure	35 psi to 125 psi (242 kPa to 861 kPa)
Water Temperature	40°F (5°C) to 100°F (38°C)
Turbidity	<5 Nephelometric Turbidity Units (NTU)
Total Suspended Solids	<10 ppm
Maximum Iron	0.3 ppm
Maximum Manganese	0.05 ppm
pH	6.5-8.5
Free Chlorine	<2 ppm
Maximum Copper	1.3 ppm
Maximum Silica	20 ppm
Total Phosphates	3 ppm or less
Total Dissolved Solids	1500 ppm or less
Maximum Ambient Temperature/Humidity	122°F(50°C) / 95% Relative Humidity (non-condensing)
Oil & H2S	None allowed
UV Transmittance (UVT)	95% UVT

D. Construction

1. Pre-packaged systems shall be constructed with commercial Lync AquaSolve® scale prevention system(s), Lync cartridge filtration system, Lync ultraviolet disinfection system(s). The number of tanks packaged in a system will be dependent on the flow rate.

Flow Rate [GPM]	Model	Lync AquaSolve®	Lync Cartridge Filtration	UV Disinfection
100	WQAS-100-D	2	1	2

2. The system shall be field installed with an integral bypass loop to isolate the AquaSolve® tank, filter housing, or UV treatment and to allow for the bypass of untreated water if service be necessary.

E. Products

1. Scale Prevention System

a. Mineral Tank

(1) The mineral tank shall be constructed of a polyethylene liner with a continuous roving outer fiberglass reinforced wrapping. The tank shall be non-ASME code with a 150-psi maximum pressure rating and a 120 deg. F (48 deg. C) maximum temperature rating and certified to NSF/ANSI STD. 61 Section 8 Material Safety Only, CSAB483.1, and NSF/ ANSI STD. 372 for Low Lead compliance. Tanks shall have a bottom base permanently installed with industrial grade adhesive. The tanks shall come with a 4” top threaded port for loading media and connection of the tank head. The tank shall be designed with a safety factor of 4:1 for minimum burst pressure.

b. Scale Prevention Media

(1) The scale prevention media shall convert dissolved bicarbonate related water hardness into inactive non-scale forming nanocrystals that will not form scale on surfaces. The media shall operate in an up-flow pattern and shall not require backwashing or chemicals for regeneration. The media shall be certified to NSF/ANSI standard 61. Media within the systems shall be replaced every three years to ensure continued scale protection.

c. Internal Distributor System

(1) The internal distributor system shall come pre-installed in the scale prevention system's media tank(s). There shall be one upper distributor and one lower distributor screen to ensure that the media cannot be washed out of the tank regardless of flow direction. The screens of the internal distribution system shall be a slotted screen type diffuser. The slots shall be sized to not allow the scale prevention media to pass through and become present in the system's effluent water. The lower distributor shall be equipped with a downward pointing shroud to direct water to the bottom most portion of the media bed before it travels upward through the media. Screens shall be constructed of PVC.

d. The Head Component

(1) The head must be constructed of 303 stainless steel. The stainless-steel head must be connected to the system with 2" inlet and outlet flex connectors.

2. Cartridge Filtration System

a. Filter Housing

(1) The filter housing shall be constructed of fiberglass reinforced polypropylene with a top opening to provide access into the filter housing for replacement of the filter cartridge. Eyebolts constructed of 304 stainless steel shall secure the removable lid. the lid shall have a brass reinforced gauge port to accept the pressure gauge to display inlet pressure. A flow baffle shall deflect the inlet water to prevent direct bombardment of inlet water against the filter cartridge. The housing will have a drain port to empty the unfiltered water compartment during filter changes and have 2" union connections for the inlet and outlet supply water. The housing shall have a 125-psi maximum pressure rating, 125 °F (48 °C) at 80 psi maximum temperature rating and certified to NSF/ANSI Standard 61. The housing shall be a Lync LCH-150.

b. Replaceable Filter Cartridge

(1) The replaceable filter cartridge shall be a single open-end pleated type 5 micron nominally rated cartridge with double O-ring end seal to eliminate bypassing of the filter. The filter shall be composed of 100% polymer to resist the growth of microbiological films. Filter cartridges should be changed before reaching a 15-psi pressure differential to prevent collapse of the filter cartridge. The filter cartridge shall be a Watts BBC-150 Pleated Cartridge.

3. Ultraviolet Disinfection System

a. Reactor Chamber(s)

(1) All wetted metal components of the reactor chamber(s) shall be constructed of 316 stainless steel. Systems shall have internally and externally threaded plumbing connections for optional male or female style connections. The reactor chamber shall be rated for 125 psi operation.

b. UV Lamp(s)

(1) The UV lamp(s) shall be a low-pressure high output type which created 254 nanometer wavelength UV C radiation suitable for disinfection of water. Lamps must be able to be dimmed by the ballast to reduce heat during periods of no flow conditions. The controller shall maintain a calendar of service on the lamp's radio frequency identification (RFID) tag so that days remaining on the lamp are updated daily and automatically.

c. Quartz Sleeve(s)

(1) The quartz sleeve house the lamp within the UV reactor chamber and are to be constructed of hard quartz glass for the lowest possible impurity content. The quarts glass must be rated for 95% UV transmittance.

d. System Controller

(1) The UV system shall come with a combination controller / power supply that monitors and controls all aspects of the UV system. All controllers shall have the capability to reduce power to the lamp by 50% during periods of no flow, which is detected by an onboard flow meter, for cooler operation and shall all have the capability to write data to the lamp's RFID tag. Controller shall include UV sensor input, 4-20 milliamp output for UV intensity (when UV Sensor is used), lamp dimming, flow switch, lamp out audible alarm, alarm output for solenoid valve, multicolor LED system status indicator, glow cap lamp indicator, lamp life timer with a graphic touch screen, radio frequency communication to lamps to verify correct lamps and remaining life of the lamp. Lamp life timer resets when a new lamp is installed. Total system hours are displayed along with key operational data.

e. Base and Piping

(1) The system shall be placed on two structural steel bases with one supporting the Lync AquaSolve® scale prevention systems and the other supporting the Lync UV and Lync cartridge filtration systems. The dimensions of the system base shall be dependent on the flow rate of the system.

(2) Interconnecting piping shall be constructed of schedule 80 PVC.

2.5 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment according to manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Domestic Water Storage Tanks:

1. Provide steel pipe support, independent of building structural framing members.

2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

D. Pumps:

1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.

2. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

3. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

E. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

END OF SECTION

Section 22 40 00 - Plumbing Fixtures

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. All-in-one lavatory system.

E. Sinks.

F. Service sinks.

G. Under-lavatory pipe supply covers.

H. Electric water coolers.

I. Eye wash fountains.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between fixtures and walls and floors.

B. Section 22 10 05 - Plumbing Piping.

C. Section 22 10 06 - Plumbing Piping Specialties.

D. Section 22 30 00 - Plumbing Equipment.

E. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. Applicable State Plumbing Code with Amendments

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

D. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.

E. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).

F. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

G. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

H. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

I. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2018.

J. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

K. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.

L. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

M. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

N. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

O. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

Q. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

R. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

S. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

T. NSF 61 - Drinking Water System Components - Health Effects; 2023.

U. NSF 372 - Drinking Water System Components - Lead Content; 2022.

V. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.1 GENERAL

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.2 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

C. Perform work according to local health department regulations.

D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.3 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, wall hung, blow-out flush action, china bolt caps.

1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.

2. Flush Valve: Concealed (back spud).

3. Flush Operation: Sensor operated, 1.6 gpf.

4. Handle Height: 44 inches or less.

5. Manufacturers:

a. American Standard, Inc: www.americanstandard-us.com.

b. Kohler Company: www.kohler.com/#sle.

c. Zurn Industries, Inc: www.zurn.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.

1. Sensor-Operated Type: Solenoid or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.

2. Concealed Type: Rough brass, exposed parts chrome plated, wall escutcheon, wheel handle stop.

3. Metering Type: Easily accessible adjustment nut.

4. Manufacturers:

a. American Standard, Inc: www.americanstandard-us.com.

b. Sloan Valve Company: www.sloanvalve.com/#sle.

c. Zurn Industries, Inc: www.zurn.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Seats:

1. Manufacturers:

a. Bemis Manufacturing Company: www.bemismfg.com/#sle.

b. Church Seat Company: www.churchseats.com.

c. Zurn Industries, Inc: www.zurn.com/#sle.

d. Kohler.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.

D. Water Closet Carriers:

1. Manufacturers:

a. JOSAM Company: www.josam.com.

b. Zurn Industries, Inc: www.zurn.com.

c. WattsRegulator Company :www.watts.com

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.4 WALL HUNG URINALS

A. Wall Hung Urinal Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.

2. Kohler Company: www.kohler.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

1. Flush Volume: 1.0 gallons, maximum.

2. Flush Style: Washout.

3. Flush Valve: Concealed (back spud).

4. Flush Operation: Sensor operated.

5. Trap: Integral.

6. Removable stainless steel strainer.

7. Supply Size: 3/4 inch.

8. Outlet Size: 2 inches.

C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.

1. Sensor-Operated Type: Solenoid operator, low voltage hard-wired, infrared sensor and over-ride push button.

2. Concealed Type: Rough brass, exposed parts chrome plated, wall escutcheon, wheel handle stop.

3. Manufacturers:

a. American Standard, Inc: www.americanstandard-us.com/#sle.

b. Sloan Valve Company: www.sloanvalve.com.

c. Zurn Industries, Inc: www.zurn.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Carriers:

1. Manufacturers:

a. JOSAM Company: www.josam.com.

b. Zurn Industries, Inc: www.zurn.com.

c. Watts Regulator Company : www.watts.com

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.5 LAVATORIES

A. Lavatory Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.

2. Kohler Company: www.kohler.com.

3. Zurn Industries, Inc: www.zurn.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, 21 inch by 18 inch minimum, with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.

C. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gallons per minute, indexed handles.

D. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.

1. Power Supply: 24 VAC.

a. For 24V applications, provide transformer.

E. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

F. Accessories:

1. Chrome plated 17 gage, 0.0538 inch brass P-trap with clean-out plug and arm with escutcheon.

2. Lawler Model 570 thermostatic mixing valve

3. Offset waste with perforated open strainer.

4. Wheel handle stops.

5. Rigid supplies.

6. Carrier:

a. Manufacturers:

(1) JOSAM Company: www.josam.com.

(2) Zurn Industries, Inc: www.zurn.com.

(3) Substitutions: See Section 01 60 00 - Product Requirements.

b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.6 WALL-HUNG MULTI-STATION LAVATORY UNITS - SOLID SURFACE

A. Description: Rectilinear, level-surface deck, seamless and integral elongated basin, with stainless steel enclosed pedestal cabinet.

B. Deck and Bowl Material: Fabricate from molded engineered stone material consisting of natural quartz, granite, and other minerals in a matrix of thermoset acrylic modified bio-based polyester resin and meeting requirements of IAPMO Z124.

C. Surface Burning Characteristics: Smoke developed index less than 450, and flame spread index less than 25, Class A, when tested according to ASTM E84.

D. Number of Wash Stations: Two.

E. Unit Length: 50 inches.

F. Soap Dispenser:

1. Wall-hung, sensor-operated, chrome-plated plastic, with LED battery and soap level indicators, single dispenser 120 VAC powerpack.

G. Color: As selected by Architect from manufacturer's full line.

H. Faucet Drilling: 4 inch (100 mm) centerset drilling.

I. Sensor-Operated Faucets:

1. High profile metering faucet with infrared and external temperature control.
2. Vandal-resistant meeting requirements of ASME A112.18.1 and ADA Standards compliant.
3. Body: Polished chrome plated commercial solid cast brass, with 4 inch (102 mm) centerset mounting with anti-rotation trim plate.
4. Tempered Water Supply: ADA Standards compliant lever on faucet body.
5. Aerator: Flow rate of 0.5 gal/min at an operating range of 20 to 80 psi.
6. Sensor Module: Water conserving, vandal-resistant adjustable sensor unit with timing turn-off delay and stationary object automatic timed cutoff, with battery diagnostic light, serviceable from above deck.
7. Power Supply: Battery-operated single faucet with 6V lithium battery and single 115 VAC plug-in adapter.
8. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

J. Access Panel: Stainless steel.

K. Support Frame: Wall mounted, heavy gage, stainless steel.

2.7 SINKS

A. Sink Manufacturers:

1. American Standard, Inc: www.americanstandard-us.com.
2. Kohler Company: www.kohler.com.
3. ELKAY.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Single Compartment Bowl: ASME A112.19.3; 31 by 22 by 6 7/8 inch outside dimensions 20 gage, 0.0359 inch thick, Type 304 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

2.8 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:

1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Adhesives, sewing threads and two ply laminated materials are prohibited.
3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
4. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
    a. Provide one piece injected molded design with internal bridge at top of J-bend to prevent separating.
    b. Comply with ASTM E84 for flame and smoke development.
    c. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
    d. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
    e. Comply with ICC A117.1.
    f. Thermal Resistance: R value of 0.504 or lower when tested by ASTM C177.

g. Thermal Conductivity: K value of 0.358 or density of 21.61 pcf per ASTM C518.

h. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21.

5. Color: High gloss white.

6. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.9 BI-LEVEL, ELECTRIC WATER COOLERS

A. Bi-level, Electric Water Cooler Manufacturers:

1. Elkay Manufacturing Company: www.elkay.com/#sle.

2. Haws Corporation: www.hawsco.com/#sle.

3. Murdock Manufacturing, Inc: www.murdockmfg.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

1. Capacity: 8 gallons per hour of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested according to ASHRAE Std 18.

2. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

2.10 SERVICE SINKS

A. Service Sink Manufacturers:

B. Bowl: 24 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

C. Trim: ASME A112.18.1 exposed wall type supply with wristblade handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:

1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.

2. Hose clamp hanger.

3. Mop hanger.

2.11 EMERGENCY EYE WASH

A. Emergency Wash Manufacturers:

1. Haws Corporation: www.hawsco.com.

2. _____.

B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging eye wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.

C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections according to minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 9200, color to match fixture.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

3.8 SCHEDULES

A. Refer to plans for plumbing fixture schedule

B. Refer to Architectural Plans for mounting heights of all fixtures.

END OF SECTION

42. Rest Area Building HVAC, Item SPV.0060.13; Maintenance Building HVAC, Item SPV.0060.017.

A Description

This item consists of the HVAC construction work for the Rest Area Building and Maintenance Building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Rest Area Building HVAC and Maintenance Building HVAC as each individual installation, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.13	Rest Area Building HVAC	EACH
SPV.0060.17	Maintenance Building HVAC	EACH

Payment is full compensation for furnishing all materials and equipment, and for supplying all labor, tools, equipment, and incidentals necessary to complete the work. The contractor can receive prorated payments for this item by submitting a detailed estimate outlining the work completed and the costs associated to the engineer for approval.

Section 23 00 10 - Basic Mechanical HVAC Requirements

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic Mechanical HVAC Requirements specifically applicable to Division 23 in addition to Division 1 - General Requirements.

1.2 SCOPE OF WORK

A. The Mechanical HVAC Contract shall also include furnishing and installing a complete heating, ventilating and air conditioning system for the new building and all other related work as called for under the specifications and shown on plans.

1.3 WORK INCLUDED

A. The Mechanical HVAC Contract shall include all work under the listed Division 23 of the Specifications Index and all related Mechanical work as shown on the Drawings for the project.

B. A Complete table of Mechanical Reference Symbols is shown on the plans.

C. Under this Contract the Mechanical Contractor shall furnish the Owner with a PDF of all pertinent systems related documents stored on a soild state external hard drive or a single flash stick. Submit a single PDF to the Engineer for his review. The Engineer will then turn information provided over to the Owner. The PDF shall contain the following items:

1. Shop drawings on all major equipment.
2. Operating Instructions for all major equipment.
3. Maintenance Instructions for all major equipment.
4. Wiring diagrams for all equipment.
5. Test and Balance Reports.
6. The Mechanical installation to be made under Division 23 is set up for contract bidding as follows:

a. Mechanical HVAC Contractor is a sub-contractor to the General Contractor.

(1) The Mechanical contractor is responsible for own equipment, such as cranes, lifts, etc. in order to provide a complete installation of mechanical systems.

(2) The Mechanical contractor shall be a sub-contractor to the General Contractor and shall include in his bid, prices from sub-contractors for control wiring, and other trades necessary to complete the entire job.

1.4 **SPECIFICATIONS COMPLIANCE**

A. The requirements of these specifications shall be complied with in every respect. Therefore, it shall be absolutely mandatory that the job foreman, all lead mechanics, subcontractors and their foreman have completely studied these specifications, be completely knowledgeable as to their entire contents, and maintain a copy at the job-site. Failure to comply with this requirement will be reason to presume the mechanic or subcontractor is not in responsible charge of his work due to ignorance of job requirements, and will be reason for the owner to require dismissal and replacement with approved personnel. Every foreman and lead mechanic shall be provided with a complete copy of this specification.

1.5 **INCONSISTENCIES**

A. If there is an inconsistency in the quality and/or quantity of Work required by the Contract Documents, either the greater quality and/or quantity of Work indicated shall be provided according to the Engineer/Architect's interpretation without change in the contract sum.

1.6 WORK NOT INCLUDED

A. The following work is not included as part of the Contract.

1. The removal and storage of any equipment in the building required to be moved or relocated during the construction process.

1.7 CODES, FEES AND LATERAL COSTS

A. The Heating, Ventilation and Air Conditioning Installation shall meet all applicable local, state and federal codes and standards.

B. All permits necessary for a complete heating and ventilation installation shall be paid for by this Contractor.

C. Except in those municipalities which provide state- approved electrical inspection, all installation of electrical equipment wiring shall be inspected by the State Board of Electricity. Allowance shall be made in the bid and contract for the cost of such inspection.

1. Fees for such inspection will be charged according to the rules and regulations of the State Board of Electricity. Evidence of payment of fees shall be provided by the Contractor with his Request for Payment.

1.8 REFERENCES

A. All equipment, piping, etc., shall be new and shall be installed to meet the approval of the following additional ordinances: ASME Rules for Pressure Tanks, National Board of Fire Underwriter's Rules, American Waterworks and the American Gas Association.

1.9 SUBMITTALS

A. Submit under provisions of Division 01 3000.

B. Products Scheduled on the Drawings by Naming one Manufacturer, but not Indicating Other Approved Manufactures in the Specifications: Use any equivalent product complying with the specifications in general and equivalent to the “Basis of Design” identified in the drawing’s schedules. Pre-bid substitutions are not required in this situation.

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. All documents shall be submitted in .pdf format unless pre-approved by Engineer. The contractor shall not use any equipment or materials that does not have the engineer’s stamped approval.

E. Mark dimensions and values in units to match those specified.

1.10 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

1.11 SEQUENCING AND SCHEDULING

A. Construct Work in sequence under provisions of Division 1.

1.12 PRE-CONSTRUCTION COORDINATION AND VERIFICATION

A. This Contractor shall coordinate his work with other Contractors on this job. Any conflict which cannot be resolved shall be settled by the Architect/Engineer.

B. Field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions.

C. The Contractors shall check architectural, structural, plumbing, heating, ventilating and electrical plans to avert possible installation conflicts. Should drastic changes from original plans be necessary to resolve such conflicts this Contractor shall notify the Architect/Engineer and secure written approval and agreement on necessary adjustments before the installation is started.

D. Discrepancies shown on different plans or between plans and actual field conditions or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision.

E. The Contractor shall consider and review the complete set of documents, etc., Architectural, Structural, Mechanical, Electrical, etc., (Drawings and Specifications) as his complete set. He will be responsible for any and all mechanical work shown or stated (to be by him), to include this work in his bid and install such items even though they are not specifically shown or stated on the Mechanical section of the plans and specifications.

1.13 **COORDINATION**

A. Contractor shall be responsible for continual coordination of the mechanical work with other trades so as to avoid conflicts in installation. Contractor shall cooperate with other trades to assure that construction proceeds in an orderly and timely manner.

B. Study the civil, structural, electrical, shop and any specialty drawings and specifications to determine required coordination.

1. Anchor bolts, sleeves, inserts and supports that may be required for the mechanical work shall be furnished and installed under the same division of the specifications as the respective items to be supported. Excluded from this requirement are cast in place anchor bolts.

2. Slots, chases, openings and recesses through floors and walls as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located in zones provided or otherwise approved by the Engineer or Architect and/or Owner.

3. Locations of pipes, panels, equipment, fixtures, etc., shall be adjusted to accommodate interferences encountered. The Project Coordinator shall determine the exact rerouting and location of each pipe and/or duct encountered prior to fabrication.

a. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.

b. Offsets, transitions and changes in direction in pipes shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the drawings.

4. Installation of Arrangement: The contractor shall install all mechanical work to permit removal of, and access to, (without damage to other parts) all parts requiring periodic replacement or maintenance.

C. Layout Priority:

1. All trades shall understand that other trades will need to work in the same areas during the project. All final decisions as to the right-of-way and runs of utility lines (pipes, ducts, etc.) shall be made by Owner and/or Architect. In general, priority shall be given as follows:

a. Process piping which must be drainable

b. Sheet metal ductwork

c. Light Fixtures

d. Plumbing waste lines, downspouts, and vents

e. Sprinkler piping

f. Gravity water lines

g. Ice water or steam lines

h. Refrigerant lines

i. Gas and air lines

j. Plumbing water

k. Electrical conduit

l. Control air lines

D. PREPARE DETAILED SHOP DRAWINGS WHERE NECESSARY TO ASSURE PROPER FIT AND NECESSARY CLEARANCE.

1.14 **CUTTING, PATCHING, AND FIRESTOPPING**

A. The Mechanical Contractor shall set all sleeves in construction for their Work.

B. Where cutting is required, it shall be done by the Mechanical Contractor.

C. All patching shall be done by Mechanical Contractor.

D. All cutting of any kind must be done with great care so as not to leave unsightly surfaces which may not be entirely concealed by plates, escutcheons, or their normal concealing construction, if such unsightly conditions occur, Mechanical Contractor will be required, at their own expense, to replace the damaged construction.

E. This Mechanical Contractor shall provide and install firestopping materials per Section 07 8400 - Firestopping.

1.15 **ACCESS PANELS REQUIRED BY TRADE**

A. Trade requiring access shall provide and install access panels where not shown or specified.

B. The finished appearance and function will be subject to approval by the Architect/Owner.

C. Provide panels that accommodate adjacent finishes in finished spaces.

D. Access panels shall meet all code requirements for each location they are installed and shall be sized appropriately.

1.16 ELECTRICAL

A. Electrical Contractor shall furnish all motor starters and motor controls and provide all wiring for motor control operation, except if specified otherwise.

1.17 ADDITIONAL ELECTRICAL COSTS

A. If the Mechanical Contractor substitutes equipment for specified units, the mechanical contractor shall be responsible for any additional electrical installation costs for this substitution whether the other equipment was listed as equal in the specification or was approved equal after the project was in the bidding process.

1.18 GUARANTEE

A. This Contractor shall be responsible for the proper installation and working of everything in this contract and shall guarantee to remedy free of charge any defects in workmanship and materials that may appear to give or gives rise to trouble of any kind for a period of one year from date of final substantial completion.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

Section 23 05 19 - Meters and Gauges for HVAC Piping

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Thermometers and thermometer wells.

C. Static pressure gages.

D. Filter gages.

1.2 RELATED REQUIREMENTS

A. Section 23 09 23 - Direct-Digital Control System for HVAC.

B. Section 23 09 93 - Sequence of Operations for HVAC Controls.

C. Section 23 21 13 - Hydronic Piping.

1.3 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.

2. Moeller Instrument Company, Inc: www.moellerinstrument.com.

3. Omega Engineering, Inc: www.omega.com.

4. Weiss

5. H.O. Trerice

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi and KPa.

2.2 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Omega Engineering, Inc: www.omega.com.
3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
4. Weiss
5. H.O. Trerice
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Stem: 3/4 inch brass.
4. Accuracy: 2 percent, per ASTM E77.
5. Calibration: Degrees F.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Stem: 3/4 inch NPT brass.
4. Accuracy: 2 percent, per ASTM E77.
5. Calibration: Degrees F.

2.4 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.5 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

C. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Viton core for temperatures up to 400 degrees F.

D. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gages, one gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.6 STATIC PRESSURE GAGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Omega Engineering, Inc: www.omega.com.
3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
4. Weiss
5. H.O. Trerice
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

C. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.

C. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gauge. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometers in air duct systems on flanges.

F. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 23 09 43. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

G. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

H. Coil and conceal excess capillary on remote element instruments.

I. Provide instruments with scale ranges selected according to service with largest appropriate scale.

J. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

K. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

L. Locate test plugs adjacent thermometers and thermometer sockets.

3.2 SCHEDULE

A. Pressure Gages, Location and Scale Range:

1. Pumps, 0 to 100 psi.

B. Pressure Gage Tappings, Location:

1. Control valves 3/4 inch and larger - inlets and outlets.
2. Major coils - inlets and outlets.
3. Chiller - inlets and outlets.
4. Boiler - inlets and outlets.

C. Stem Type Thermometers, Location and Scale Range:

1. Headers to central equipment, 0 to 250 degrees F.
2. Coil banks - inlets and outlets, 0 to 250 degrees F.
3. Heat exchangers - inlets and outlets, 0 to 250 degrees F.

D. Dial Thermometers, Location and Scale Range:

1. Outside air, 0 to 150 degrees F.
2. Return air, 0 to 150 degrees F.
3. Mixed air, 0 to 150 degrees F.

E. Static Pressure and Filter Gages, Location and Scale Range:

1. Built up filter banks, 0 to 3 inches W.C..
2. Unitary filter sections, 0 to 3 inches W.C..
3. Supply fan discharge, 0 to 3 inches W.C..
4. Building static, 0 to .5 inches W.C..

END OF SECTION

Section 23 05 53 - Identification for HVAC Piping and Equipment

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.2 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Label from labelmaker on ceiling grid where located above lay-in ceiling.

C. Automatic Controls: Tags. Key to control schematic.

D. Control Panels: Nameplates.

E. Dampers: Ceiling tacks, where located above lay-in ceiling.

F. Ductwork: Nameplates.

G. Heat Transfer Equipment: Nameplates.

H. Piping: Pipe markers.

I. Pumps: Nameplates.

J. Tanks: Nameplates.

K. Thermostats: Nameplates.

L. Valves: Tags

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.3 NAMEPLATES

A. Manufacturers:

1. Seton Identification Products, a Tricor Direct Company: www.seton.com.

2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.

2. Letter Height: 1/2 inch.

3. Background Color: Black.

2.4 TAGS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.

2. Seton Identification Products, a Tricor Company: www.seton.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.5 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.

2. Seton Identification Products, a Tricor Company: www.seton.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Color code as follows:

1. Heating, Cooling, and Boiler Feedwater: Green with white letters.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. HVAC Equipment: Yellow.

2. Fire Dampers and Smoke Dampers: Red.

3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces according to Section 09 91 23 for stencil painting.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers according to manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe according to manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify thermostats relating to terminal boxes or valves with nameplates.

I. Identify valves in main and branch piping with tags.

J. Identify air terminal units and radiator valves with numbered tags.

K. Tag automatic controls, instruments, and relays. Key to control schematic.

L. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

M. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

N. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

E. Vibration measurement of equipment operating conditions.

1.2 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; 2019.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.

2. Include at least the following in the plan:

a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

d. Final test report forms to be used.

e. Detailed step-by-step procedures for TAB work for each system and issue, including:

(1) Terminal flow calibration (for each terminal type).

(2) Diffuser proportioning.

(3) Branch/submain proportioning.

(4) Total flow calculations.

(5) Rechecking.

(6) Diversity issues.

f. Expected problems and solutions, etc.

g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.

h. Details of how TOTAL flow will be determined; for example:

(1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

(2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

j. Confirmation of understanding of the outside air ventilation criteria under all conditions.

k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

l. Method of checking building static and exhaust fan and/or relief damper capacity.

m. Proposed selection points for sound measurements and sound measurement methods.

n. Methods for making coil or other system plant capacity measurements, if specified.

o. Time schedule for TAB work to be done in phases (by floor, etc.).

p. Description of TAB work for areas to be built out later, if any.

q. Time schedule for deferred or seasonal TAB work, if specified.

r. False loading of systems to complete TAB work, if specified.

s. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

t. Interstitial cavity differential pressure measurements and calculations, if specified.

u. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

v. Procedures for formal progress reports, including scope and frequency.

w. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least twice a week to the Commissioning Authority and Construction Manager.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Progress Reports.

F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit under provisions of Section 01 40 00.

2. Submit to the the Commissioning Authority and Construction Manager within two weeks after completion of testing, adjusting, and balancing.

3. Revise TAB plan to reflect actual procedures and submit as part of final report.

4. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

5. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

6. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

7. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

8. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

9. Include the following on the title page of each report:

    a. Name of Testing, Adjusting, and Balancing Agency.

    b. Address of Testing, Adjusting, and Balancing Agency.

    c. Telephone number of Testing, Adjusting, and Balancing Agency.

    d. Project name.

    e. Project location.

    f. Project Architect.

    g. Engineer.

    h. Contractor.

    i. Project altitude.

    j. Report date.

G. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance according to one of the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.

2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

3. SMACNA (TAB).

4. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Having minimum of three years documented experience.

3. Certified by one of the following:

a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.

5. Duct systems are clean of debris.

6. Fans are rotating correctly.

7. Fire and volume dampers are in place and open.

8. Air coil fins are cleaned and combed.

9. Access doors are closed and duct end caps are in place.

10. Air outlets are installed and connected.

11. Duct system leakage is minimized.

12. Hydronic systems are flushed, filled, and vented.

13. Pumps are rotating correctly.

14. Proper strainer baskets are clean and in place.

15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.

2. Discrepancies, deficient or uncompleted work by others.

3. Contract interpretation requests.

4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.7 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 SCOPE

A. Test, adjust, and balance the following:

1. Plumbing Pumps.
2. HVAC Pumps.
3. WaterCooled Refrigerant Condensers.
4. Heating/Cooling Units.
5. Energy Recovery Ventilators
6. Air Coils.
7. Infloor Radiant Heat
8. Air Handling Units.
9. Fans.
10. Air Filters.
11. Air Terminal Units.
12. Air Inlets and Outlets.

3.9 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.

6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Pumps:

1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D. Water Cooled Condensers:

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering temperature, design and actual.
7. Leaving temperature, design and actual.
8. Number of compressors.

E. Heat Pumps:

1. Identification/number.
2. Manufacturer.
3. Capacity.
4. Model number.
5. Serial number.
6. Evaporator entering water temperature, design and actual.
7. Evaporator leaving water temperature, design and actual.

8. Evaporator pressure drop, design and actual.
9. Evaporator water flow rate, design and actual.
10. Condenser entering water temperature, design and actual.
11. Condenser pressure drop, design and actual.
12. Condenser water flow rate, design and actual.

F. Cooling Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.
14. Saturated suction temperature, design and actual.
15. Air pressure drop, design and actual.

G. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

H. Electric Duct Heaters:
1. Manufacturer.
2. Identification/number.
3. Location.
4. Model number.
5. Design kW.

6. Number of stages.
7. Phase, voltage, amperage.
8. Test voltage (each phase).
9. Test amperage (each phase).
10. Air flow, specified and actual.
11. Temperature rise, specified and actual.

I. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

J. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

K. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.

5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

L. Duct Traverses:
1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

M. Duct Leak Tests:
1. Description of ductwork under test.
2. Duct design operating pressure.
3. Duct design test static pressure.
4. Duct capacity, air flow.
5. Maximum allowable leakage duct capacity times leak factor.
6. Test apparatus:
    a. Blower.
    b. Orifice, tube size.
    c. Orifice size.
    d. Calibrated.
7. Test static pressure.
8. Test orifice differential pressure.
9. Leakage.

N. Flow Measuring Stations:
1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.

8. Design pressure drop.

9. Actual/final pressure drop.

10. Actual/final flow rate.

11. Station calibrated setting.

3.10 APPROVAL

A. The commissioning authority shall provide comments to the engineer.

B. The engineer shall review the final test and balance report and the commissioning authority report. The engineer will confirm that the test and balance meets design and will have final say on the approval of the test and balance report.

END OF SECTION

Section 23 07 13 - Duct Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.2 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Samples: Submit two samples of any representative size illustrating each insulation type.

D. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1. Applicator to be manufacturer certified in the installation of product.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather, sunlight, and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested according to ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Johns Manville: www.jm.com/#sle.
2. Knauf Insulation: www.knaufinsulation.com/#sle.
3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
4. CertainTeed Corporation;: www.certainteed.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. 'K' value: 0.27 at 75 degrees F, when tested according to ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested according to ASTM E96/E96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive acrylic based adhesive.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. Johns Manville: www.jm.com/#sle.
2. Knauf Insulation: www.knaufinsulation.com/#sle.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com/#sle.

B. Insulation: ASTM C612; rigid, noncombustible blanket.

1. 'K' Value: 0.24 at 75 degrees F, when tested according to ASTM C518.
2. Maximum Service Temperature: 450 degrees F.

3. Maximum Water Vapor Absorption: 5.0 percent.

4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch, when tested according to ASTM E96/E96M.

3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive acrylic based adhesive.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Armacell LLC: www.armacell.us/#sle.

2. K-Flex USA LLC: www.kflexusa.com/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.5 JACKETS

A. PVC Plastic.

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com.

b. Substitutions: See Section 01 6000 - Product Requirements.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested according to ASTM E96/E96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic:

a. Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Install according to NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:

1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Rigid Glass Fiber Duct Insulation.

END OF SECTION

Section 23 07 19 - HVAC Piping Insulation

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.2 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

D. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2022.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested according to ASTM E84 or UL 723.

2.2 POLYISOCYANURATE CELLULAR PLASTIC

A. Insulation Material: ASTM C 591, rigid molded modified polyisocyanurate cellular plastic.

1. Dimension: Comply with requirements of ASTM C 585.

2. 'K' value: 0.19 at 75 degrees F, when tested according to ASTM C 518.

3. Minimum Service Temperature: -297 degrees F.

4. Maximum Service Temperature: 300 degrees F.

5. Water Absorption: less than 0.7 percent by volume, maximum, when tested according to ASTM D 2842..

6. Moisture Vapor Transmission: 4.0 perm in.

7. Adhesive, Joint Sealers and Mastics: Solvent and water based adhesives, joint sealer and mastics may be used. Mastics shall remain flexible at the lowest expected ambient temperature.

8. Vapor retarder type mastic or joint sealers should be applied on insulation longitudinal joints and butt joints to prevent moisture and moisture vapor infiltration.

9. Vapor Retarder: Dow Chemical Industry Model Saran 540 Vapor Retarder Film and Saran 510 Vapor Retarder Tape. Refer to ASTM standards C-755, C-921 and C-1136.

10. Protective Jacket: Aluminum Metal Cladding. Jacketing shall be aluminum alloys 3003, 1100 or 3105 meeting ASTM B-209 with H-14 temper and minimum 2-1/2 mil thick polysurlyn moisture barrier on the inner side. Aluminum for all fittings, tees, elbows, valves, caps, etc. shall be sectional, factory contoured or field fabricated to fit closely around insulation.

11. All pipe insulation and related components shall be installed according to manufacturer's instructions.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

1. Aeroflex USA, Inc; Aerocel ULP: www.aeroflexusa.com/#sle.

2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.

3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature:

a. 1 inch and below = 220F

b. 1.5 and 2" = 300F

3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.4 JACKETS

A. PVC Plastic.

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com/#sle.

b. Substitutions: See Section 01 60 00 - Product Requirements.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 350 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested according to ASTM E96/E96M.

d. Thickness: 10 mil.

e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

1. Thickness: 0.016 inch sheet.

2. Finish: Smooth.

3. Joining: Longitudinal slip joints and 2 inch laps.

4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.

5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Install according to NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids above or below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. For all systems, provide and install removable blanket insulation jackets on all fittings and accessories not limited to, but including; valves, unions, flanges, strainers, flexible connections, and expansion joints, that require regular maintenance. Insulation shall be encased in an inner and outer jacket of Teflon impregnated fiberglass fabric rated at a temperature exceeding the pipe system design temperature. Manufacturer: Newtex, Zetex Plus or approved equal.

F. All elbows and fittings shall be pre-formed or mitered fitting and the same materials and thickness as the pipe insulation. Butt joints and seams are to be sealed with the manufacturer’s recommended adhesive. No substitution allowed. Failure to provide the same insulation thickness at elbows and fittings will require replacement by the contractor at no cost to the Owner.

G. All insulation ends shall be sealed waterproof, and end covers shall be stainless steel on systems over 140° F.

H. Elbows, Tees, and Fittings.

1. Provide mitered or nesting preformed insulation, wired in place with 20 gauge stainless wire.

2. Insulation shall be of the same type and thickness as required for the pipe. No substitution allowed. Failure to provide the same insulation at elbows and fittings will require replacement by the contractor at no cost to the Owner.

3. Joints or voids shall be filled and smoothed with insulating cement or tape as recommended by the manufacturer.

4. Deformation of insulation jackets by voids is not allowed and subject to replacement by the contractor at no cost to the owner.

I. Closed Cell insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Pre-fabricated insulation elbows, tees, and fabricated covers for grooved fittings and couplings to reduce complex cutting and assembly of insulation in the field. Provides complete system integrity for thermal performance and controlling condensation drip from below-ambient systems when used as part of an Armaflex pipe insulation system. UL GREENGUARD Gold Certified for low VOC's and includes Microban® antimicrobial protection from the growth of mold and mildew in the system.

J. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

K. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

L. Glass fiber insulated pipes conveying fluids above ambient temperature.

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

M. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

6. ArmaFix EcoLight Pipe Supports: Pipe supports with a load-bearing PET core to support and protect the insulation from crushing or damage, maintaining the thermal integrity of the system and preventing thermal bridging. Armacell insulation is located on the outer part for connection to Armacell's Armaflex insulations. Matches all wall thickness and ID dimensions of Armacell's tube insulation offerings.

N. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

O. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces : Finish with PVC jacket and fitting covers.to 10ft above finished floor.

P. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

Q. Buried Piping:

1. Manufacturers:

a. Perma Pipe Model XtruTherm

b. Substitutions: See Section 01 6000 - Product Requirements.

2. GENERAL

a. All underground and aboveground chilled water, condensate return, and hot water lines with design temperatures up to 250OF shall be XTRU-THERM as manufactured by PERMA-PIPE. All straight sections, fittings, anchors and other accessories shall be factory fabricated, insulated, and jacketed. The piping system layout shall be analyzed by the piping system manufacturer to determine the stresses and displacements of the service pipe. The piping system design and manufacture shall be in strict conformance with ASME B31.1, latest edition. Installation of the piping system shall be according to the manufacturer's instructions. Factory trained field technical assistance shall be provided for critical periods of installation, unloading, field joint instruction and testing.

3. SERVICE PIPE*

a. The service pipe shall be standard weight ASTM A53 Gr. B ERW carbon steel, except for condensate return lines, which shall be Schedule 80. All joints shall be butt-welded for 2 1/2" and larger, and socket or butt-welded for 2" and smaller. Where possible, straight sections shall be supplied in 40-foot random lengths with piping exposed at each end for field joint fabrication.

4. ACCESSORIES

a. Elbows, tees, reducers, anchors, field joints, and end seals shall be designed and factory fabricated to prevent the ingress of moisture into the system.

5. INSULATION

a. The service pipe insulation shall be polyurethane foam with 2.0 Lbs./Ft.2 minimum density, 90% minimum closed cell content and initial thermal conductivity of 0.16 Btu in./Hr. FT2 OF. The insulation shall completely fill the annular space between the service pipe and jacket and shall be bonded to both. Systems using open cell insulation or a non- bonded design shall not be allowed. The insulation shall be provided to the minimum thickness specified below:

6. INSULATION JACKET

a. The outer protective insulation jacket shall be seamless high-density polyethylene (HDPE) according to ASTM D1248, type 3, Class C. PVC or tape materials are not allowed. The minimum thickness of the HDPE jacket shall be as follows: Jacket OD (in.) Minimum Jacket Thickness (in.)

b. OD < 12 0.125

c. 12 < OD < 24 0.150

d. OD > 24 0.175

7. FITTINGS

a. All fittings shall be factory prefabricated and pre-insulated. Straight tangent lengths shall be added to all ends so that all field joints are at straight sections of pipe. Elbow jackets shall be molded HDPE. Tee jackets shall be extrusion welded or butt fusion welded HDPE. Gluing, taping or hot air welding shall not be allowed.

8. FIELD JOINTS

a. The service pipe shall be hydrostatically tested to 150 psig or 1 1/2 times the design pressures whichever is greater. Insulation shall then be poured in place into the field joint area. All field-applied insulation shall be placed only in straight sections of pipe. Field insulation of fittings is not acceptable. The installer shall seal the field joint area with a heat shrinkable adhesive backed sleeve. Backfilling shall not begin until the heat shrink sleeve has cooled. All insulation and jacketing materials for the field joint shall be furnished by PERMA-PIPE.

9. BACKFILL

a. A 4-inch layer of sand or fine gravel shall be placed and tamped in the trench to provide a uniform bedding for the pipe. The entire trench width shall be evenly backfilled with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches above the top of the insulated pipe. The remaining trench shall be evenly and continuously backfilled and compacted in uniform layers with suitable excavated soil.

END OF SECTION

Section 23 09 13 - Instrumentation and Control Devices for HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control Valves:

1. Ball valves and actuators.
2. Globe pattern.
3. Electronic operators.
4. Radiation valves.

B. Dampers.

C. Damper Operators:

1. Electric operators.

D. Humidistats:

1. Room humidistats.

E. Input/Output Sensors:

1. Temperature sensors.
2. Humidity sensors.
3. Static pressure (air pressure) sensors.

F. Transmitters:

1. Air pressure transmitters.
2. Water pressure transmitters (liquid differential pressure transmitters).

G. Flow Sensors:

1. Insertion magnetic flow meters.

H. Control valves.

1.2 RELATED REQUIREMENTS

A. Section 23 21 13 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gauge taps.

B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

C. Section 26 27 26 - Wiring Devices: Elevation of exposed components.

1.3 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.

1.4 SUBMITTALS

A. Shop Drawings: Provide schematic type drawings as follows: These drawings are to be diagrammatic and are not to show any more offsets, bends, or crossing line than absolutely necessary.

1. In diagrams, show complete system schematics with electrical devices, wiring and tubing indicated. Indicate function, set point, sensitivity action, authority, and proportional band for each device as appropriate.
2. All control devices shall be completely identified with manufacturer's type, number, and functional description.
3. Show all temperature, voltage, amperage, spring range, and differential settings of the devices.

4. Show normal positions of all devices and explain the device and system function.

5. Show all electric connections of the control system to equipment furnished by others, complete to terminal points specifically identified with manufacturer's terminal designation.

6. In booklet form, provide catalog data on all control device types, including control operation description, technical parameters and connection identifications. Describe the complete sequence of operation containing all information necessary for clarity and understanding of device function and system sequence of operation.

B. Operational and Maintenance Manuals: Complete manuals including as-built schematics shall be provided for approval. Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

C. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.5 PROJECT SITE CONDITIONS

A. Record Drawings

1. In accordance with Division 1, “General Requirements”, record drawings will be required at job’s completion.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2 CONTROL VALVES

A. Ball Valves and Actuators:

1. Service: Use for brine (30 percent glycol), chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).

2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally open (NO).

3. Replacements in Kind: Provide pressure-independent type.

4. ANSI Rating: Class 150.

5. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.

6. Body Size:

a. Under 2-1/2 inches:

(1) Connection: NPT.

(2) Materials:

(1) Body: Brass.
(2) Flanges: Ductile iron.
(3) Ball: Chrome-plated brass.
(4) Stem: Nickel-plated brass.
(5) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
(6) Stem Seal: EPDM O-Rings.
(7) Flow Control Disk: Thermoplastic synthetic-resin.

b. 2-1/2 inches and Above:

(1) Connection Type: Flanged.

(2) Materials:

(1) Body: Brass.
(2) Flanges: Ductile iron.
(3) Ball: 300 series stainless steel.
(4) Stem: 300 series stainless steel.
(5) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
(6) Stem Seal: EPDM O-Rings.
(7) Flow Control Disk: Thermoplastic synthetic-resin.

c. Service Temperature:

(1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.

7. Actuator Requirements:

a. Assembly: Factory-mounted.

b. Input: 0 to 5 VDC configured for 2-position (open/close) control.

c. Accessories: Provide with valve position indicator and manual override.

B. Globe Pattern:

1. Up to 2 inches: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends.

2. Over 2 inches: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.

3. Hydronic Systems:

a. Rate for service pressure of 125 psig at 250 degrees F.

b. Replaceable plugs and seats of stainless steel.

c. Size for 3 psig maximum pressure drop at design flow rate.

d. Two way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two way valve operators to close valves against pump shut off head.

C. Electronic Operators:

1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.

2. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.

3. Select operator for full shut off at maximum pump differential pressure.

D. Radiation Valves:

1. Bronze body, bronze trim, 2 or 3 port as indicated, replaceable plugs and seats, union and threaded ends.

2. Size for 3 psig maximum pressure drop at design flow rate.

3. two-way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two-way valve operators to close valves against pump shut off head.

4. Operators (Modulating): Self-contained, linear motorized actuator with approximately 3/4 inch stroke, 60 second full travel with transformer and SPDT contacts: 24 v DC, 6 watt maximum input.

2.3 DAMPERS

A. Performance: Test according to AMCA 500-D.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch.

C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, 0.0299 inch, attached to minimum 1/2 inch shafts with set screws.

D. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.

E. Jamb Seals: Spring stainless steel.

F. Shaft Bearings: Oil impregnated sintered bronze.

G. Linkage Bearings: Oil impregnated sintered bronze.

H. Leakage: Less than one percent based on approach velocity of 2000 feet per min and 4 inches wg.

I. Maximum Pressure Differential: 6 inches wg.

J. Temperature Limits: Minus 40 to 200 degrees F.

2.4 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

2. Provide one operator for maximum 36 sq feet damper section.

B. Electric Operators:

1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.5 INPUT/OUTPUT SENSORS

A. Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.

2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.

3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.

4. Temperature Sensing Device: Compatible with project DDC controllers.

5. Performance Characteristics:

B. Humidity Sensors:

1. Wall Mounted Sensor: Voltage type encased in a plastic housing.

a. Humidity:

(1) Accuracy 2 percent at 10 to 80 percent relative humidity at 77 degrees F.

2.6 THERMOSTATS

A. Line Voltage Thermostats:

1. Integral manual On/Off/Auto selector switch, single or two pole as required.

2. Dead Band: Maximum 2 degrees F.

3. Cover: Locking with set point adjustment, with thermometer.

4. Rating: Motor load.

2.7 TRANSMITTERS

A. Pressure Transmitters:

1. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.

B. Air Pressure Transmitters:

1. General: Provide dry media differential pressure transducers to monitor duct and room pressure.

C. Water Pressure Transmitters (Liquid Differential Pressure Transmitters):

1. General: Provide wet media differential pressure transducers with 6 feet (1.83 m) armored cable, to allow remote pressure sensing capability using existing plumbing runs.

a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.

b. Output: 3-wire transmitter; user-selectable, 4 to 20 mA (0 to 5V/0 to 10V).

c. Pressure Ranges:

(1) 0 psi to 50 psi (Gauge): 5 psid/10 psid/25 psid/50 psid (pressure differential).

d. Operating Conditions:

(1) Sensor Operating Range: Minus 4 degrees F to 185 degrees F.

(2) Operating Environment: 14 degrees F to 122 degrees F; 10 to 90 percent RH noncondensing.

D. Temperature Transmitters:

1. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1/2 percent of range for 200 degrees F span and plus or minus 1 percent for 50 degrees F span, with 50 degrees F. temperature range, compensated bulb, averaging capillary, or rod and tube operation on 20 psig input pressure and 3 to 15 psig output.

2.8 FLOW SENSORS

A. Insertion Magnetic Flow Meters:

1. Provide insertion type magnetic flow meters with all installation hardware necessary to enable the insertion and removal of the meter without system shutdown.

2. All Parts: Meet or exceed the pressure classification of the piping system installed in.

3. Accuracy: No greater than 1 percent of the rate from 2 fps to 20 fps.

4. Fabricate wetted material parts from 300 series stainless steel.

5. Include 4 to 20 mA dry contact pulse outputs, 0 to 10 VDC.

2.9 WIRING FOR CONTROLS AND POWER

A. All wiring exposed in the process space shall be threaded aluminum.

B. All wiring concealed in walls or outdoors shall be in thin wall or galvanized steel conduit. Elsewhere, plenum rated cable shall be used. Installation conforming to all applicable codes and Electrical Specifications.

C. Provide Type THHN control conductors 18 to 22 gauge stranded and with at least one spare circuit (two wires) for each conduit run. Color coding shall be: Blue: common; Yellow: signal; Red: 20V AC power.

D. All 120 volt control wiring shall be a minimum of 14 gauge stranded, THHN insulation and properly protected against overcurrent. Color coding shall be: Black: hot; White: neutral; Green: ground.

E. Sensor wire shall be two conductor 18 to 22 gauge stranded and shielded Beldon cable.

F. Control voltage shall be either 24-V dc or 120-V ac.

G. Conduit Sizing: Minimum size conduit shall be ¾". Conduits shall be sized for 25% future capacity and all conduits larger than 1" shall have a nylon pull string installed with the wire to accommodate pulling future wires.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Instrument Mounting

1. Controls are to be securely mounted. Adequately reinforce and make airtight all duct and wall penetrations. Instrument mounting locations must be free of vibration. Mounting of operators directly to sheet metal lighter than 18 gauge without adequate reinforcing is prohibited.

B. Control Adjustment

1. Temperature control settings indicated are approximate and intended to indicate range of instruments to be used. Adjustments are to be made as required by individual location, job requirements, and local conditions.

C. Control Conduit and Wiring

1. All wiring and conduit to follow approved routes. Provide proper support for a neat, workmanlike appearance.

2. Provide protection against accidental damage by locating well above ceiling tile and/or pipe hangers in the overhead structure away from frequented traffic in areas of access for repair.

D. Install according to manufacturer's instructions.

E. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats. Refer to Section 26 27 26.

F. Provide conduit and electrical wiring according to Section 26 05 83. Electrical material and installation shall be according to appropriate requirements of Division 26.

3.3 CONTROL SEQUENCES

A. Unless otherwise specified, temperature control functions shall have a maximum differential of 3°F, adjustable. Temperature switching functions shall be 2°F differential, or less. Where more than one item is indicated to operate at the same two position setting, all items are to operate from a common controller through a suitable relay.

3.4 FIELD QUALITY CONTROL

A. General

1. The installation, operation and adjustment of the control system is the responsibility of the control system contractor.

B. Adjustments

1. The entire control system shall be adjusted by a qualified representative of the control system contractor or general contractor.

2. Adjust each control system to maintain the temperatures indicated. Coordinate start-up of equipment with the manufacturer's representative.

3. Heating system control adjustments are to be made with outside temperatures of 50°F or lower, and cooling system control adjustments shall be made with outside temperatures of 65°F or higher. Temporary adjustments may be made under other outside temperature conditions, but final adjustments must be made under actual operating conditions listed above.

C. Instruction of Owner Personnel

1. Complete instructions, both verbal and written, of the control systems programming, operation and maintenance shall be provided to four of the Owner's designated representatives by the control project manager or an approved instructor upon project completion. The presentation shall be at least 2 hours in length.

2. Locate all control components for the owner’s personnel.

END OF SECTION

Section 23 09 24 - Direct Digital Control for HVAC

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. Furnish all labor, materials, equipment, service, and training necessary for a complete, operational, and fully commissioned direct digital control system for the facilities identified on the contract drawings. Requirements include HVAC system control and door operating control. The system shall use the BACNet protocol at the field bus level of the architecture and either BACnet at the TCP/IP level. Furnish all labor, materials, equipment, service and training necessary to complete the new direct digital control system.

B. The building shall be stand alone, but shall be capable of integration into a district wide system via BACnet.

C. The new BAS shall be accessed and fully functional through remote web access. Coordinate with the owner's IT department. The owner shall provide all LAN IP connections and/or WAN IP or VPN connections.

1.2 RELATED SECTIONS

A. Section 28 3100, Fire Alarm Systems

B. Section 23 0800, Commissioning

C. Section 23 0500, Basic Mechanical Requirements

D. Section 23 7000, Air Handling Units

E. Section 23 0593, Testing, Adjusting and Balancing

F. Section 26 0500, Basic Electrical Requirements

G. Section 26 2000, Cables, Low Voltage (600 Volts and Below)

H. Section 26 2726, Wiring Devices

I. Section 26 0500, Basic Electrical Materials

J. Section 26 3323, Emergency Systems

1.3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23 2113, Hydronic Piping

1. Control Valves
2. Flow Switches
3. Temperature Sensor Wells and Sockets
4. Flow meters

B. Section 23 2300, Refrigerant Piping

1. Pressure and Temperature Sensor Wells and Sockets

C. Section 23 3300, Ductwork Accessories

1. Automatic Dampers
2. Airflow Stations
3. Terminal Unit Controls

1.4 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. Section 23 6000, Refrigeration Equipment

1. Heat Pump Controls

B. Section 23 3600, VAV Terminal Units

1. Cross Flow CFM Sensors

1.5 RELATED DOCUMENTS

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

1.6 CODES, STANDARDS AND REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

1. AMCA 500-D (1998) Laboratory Methods of Testing Dampers for Rating

C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1. ANSI/ASHRAE 15 (2001) Safety Code for Mechanical Refrigeration

2. ANSI/ASME B16.34 (1996) Valves – Flanged, Threaded, and Welded Ends

3. ANSI C12.1 (1995) Code for Electricity Metering

4. ANSI/EIA 709.1B (2002) Control Network Protocol Specification

5. ANSI/EIA 709.3 (2003) Free-Topology Twisted-Pair Channel Specification

6. ANSI/FCI 70.2 (2003) Control Valve Seat Leakage

D. AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

1. ASHRAE Handbook of Fundamentals

E. ECHELON

1. Junction Box and Wiring Guideline for Twisted Pair LonWorks® Networks, July 2003

F. FEDERAL COMMUNICATIONS COMMISSION (FCC)

1. FCC EMC (2002) FCC Electromagnetic Compliance Requirements

2. FCC Part 15 (2002) FCC Rules and Regulations Part 15: Radio Frequency Devices (Volume II)

G. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

1. IEEE C62.41 (1991; R 1995) Surge voltages in Low-Voltage AC Power circuits

2. IEEE 100 (2000) IEEE Standard Dictionary of Electrical and Electronics Terms

3. IEEE 142 (1991) IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems

4. IEEE 802.1D (1998) Media Access Control Bridges

5. IEEE 802.2 (1998) Standards for Local Area Networks: Logical Link control

H. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

1. ISO OSI Model Open Systems Interconnection Reference Model

I. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

1. NEMA 250 (1997) Enclosures for Electrical Equipment (1000 Volt Maximum)

J. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 70 (2002) National Electrical Code

2. NFPA 90A (1996) Installation of Air Conditioning and Ventilation Systems

3. NFPA 262 (2002) Test for Flame-Propagation and Smoke Density Values for Electrical and Optical Fiber Cables Used in Spaced Transporting Environmental Air

K. UNDERWRITER'S LABORATORIES (UL)

1. UL 1778 (2003) Standard for Uninterruptible Power Supply Equipment
2. UL 60950 (2000) Safety of Information Processing and Business Equipment
3. UL 916 (2002) Energy Management Equipment
4. UL 1585 (2001) Class 2 and Class 3 Transformers
5. UL 555 (1995) Standard for Fire Dampers
6. UL 555S (1996; R2000) Leakage Rated Dampers for Use in Smoke Control Systems
7. UL 94 (1996; Rev through July 1998) Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
8. UL 268A (1998) Smoke Detectors for Duct Application

L. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

1. 47 CFR Part 15Radio Frequency Devices
2. 21 CFR Part 11Administrative Practice and Procedure, Computer Technology, Reporting and Record Keeping Requirements

1.7 SUBMITTALS

A. Shop Drawings and Product Data shall meet the requirements of Section 01 1300.

1. Shop drawings shall be 11 inch by 17 inch, landscape, bound on the left edge. They shall be produced with Microsoft Visio. Organize the packages by building.
2. All text based documents and product data sheets shall be 8 ½ inch by 11 inch format bound on the left edge. To the maximum extent possible Adobe Acrobat shall be used to produce the documents in an X.pdf format.
3. Software files shall be submitted on fully labeled CDs that shall include a table of contents file in pdf format that provides a description of all of the files on the CD.

B. Submittals Prior To Construction

1. Shop Drawings

a. System Architecture Design Diagram:

(1) This is a riser diagram that shall show the IP layer and all of the field bus layers.

(2) It shall show each computer, printer, router, repeater, controller and protocol translator that is connected to either the IP layer or any of the field busses.

(3) This diagram shall include the existing control system that is to be integrated into the common enterprise level system.

(4) Each component that is shown shall have a name that is representative of how it will be identified in the completed database and the manufacturer's name and model number. Example: Device C17: AHU1 Controller, TAC, Xenta Model 302

(5) The physical relationship of one component to another component shall reflect the proposed installation. Example: If AHU1 controller is the closest controller to the IP to BACnet router on the field bus, then this device shall be shown as the first device on the riser diagram just below the IP to BACnet router.

(6) This diagram shall not include power supplies, sensors or end devices.

b. Layout Design Drawing for each control panel:

(1) The layout drawing shall be to scale with all devices shown in their proposed positions.

(2) All control devices shall be identified by name.

(3) All terminal strips and wire channels shall be shown.

(4) All control transformers shall be shown.

(5) All 120 VAC receptacles shall be shown.

(6) All IP connection points shall be shown.

c. Wiring Design Diagram for each control panel.

(1) The control voltage wiring diagram shall clearly designate devices powered by each control transformer. If the control devices use half wave power, the diagram shall clearly show the consistent grounding of the appropriate power connection. All wire identification numbers shall be annotated on the diagram.

(2) The wiring diagram shall clearly show the use of the daisy chain wiring concept, the order in which the devices are connected to the network and the location of end of segment termination devices. All wire identification numbers shall be annotated on the diagram.

(3) If shielded communication wiring is used, the grounding of the shield shall be shown.

(4) The terminal strip wiring diagram shall identify all connections on both sides of the terminal strip. Wiring label numbers for all wiring leaving the control panel shall be annotated on the diagram.

d. Wiring Design Diagram for individual components (controllers, protocol translators, etc.): The wiring diagram for each component shall identify all I/O, power and communication wiring, and the locations on the terminal blocks to which the wires are landed. Example: Fan Status sensor is wired from terminals 5/6 on the controller to terminals 17 and 18 on the terminal strip.

e. Installation Design Detail for each I/O device.

(1) Include a drawing of the wiring details for each sensor and/or end device.

(2) For devices with multiple quantities a standard detail may be submitted.

f. A System Flow Design Diagram for each controlled system.

(1) A two dimensional cross sectional diagram showing key components such as fans, coils, dampers, valves, pump, etc.

(2) Identify the locations and names of all sensors and end devices that are associated with the control system. Label the panel name and terminal numbers where the connections are landed.

(3) A legend shall be provided for all symbols used.

2. Data

a. Direct Digital Control System Hardware Technical Data.

(1) A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.

(2) Manufacturer's description and technical data for each unique device to include performance curves, product specification sheets and installation instructions. When a manufacturer's data sheet refers to a series of devices rather than a specific model, the data specifically applicable to the project shall be highlighted or clearly indicated by other means.

(3) This requirement applies to:

(1) Controllers
(2) Transducers/Transmitters
(3) Sensors
(4) Actuators
(5) Valves
(6) Relays and Switches
(7) Control Panels
(8) Power Supplies
(9) Batteries
(10) Operator Interface Equipment

b. An Instrumentation List for each system.

(1) The list shall be in a table format.

(2) Include name, type of device, manufacturer, model number and product data sheet number.

c. Sequence of Control: A sequence of control for each system being controlled. Include the following as a minimum.

(1) Process control sequence for each end device.

(2) Supervisory logic sequence of control for each system.

(3) The impact of each global application program on the sequence of control (Example: Demand Control).

(4) A list of all physical inputs and outputs associated with each sequence.

(5) Within the sequence of control, all application parameters that are to be user adjustable from an OWS shall be annotated with ("adj") after the name of the parameter. This shall include set points, reset schedule parameters, calibration offsets, timer settings, control loop parameters such as gain, integral time constant, sample rates, differentials, etc.

(6) Within the sequence of control, all calculated values that are to be viewable at the OWS shall be annotated with ("rpt") after the name.

(7) A list of all points that shall be subject to manual control from an operator workstation.

(8) A list of all alarm points, a description of the alarm and a description of the alarm criteria.

(9) A list of all variables for which historical trending will be applied, the sample rates and any criteria used to start and stop the historical trending.

d. Binding Map

(1) A list of the device to device data flow. This shall not include the flow of data from devices to the presentation system.

(2) Include:

(1) Description of the variable
(2) Sending device
(3) Receiving device
(4) SNVT used

e. Graphic Pages: Submit a sample graphic page for each type of page described in the specification section on graphic pages.

C. SUBMITTALS DURING CONSTRUCTION

1. Training Manuals for each Training Course

a. Six weeks in advance of the training, submit the following:

(1) List of training objectives.

(2) Outline of the course with time allocations per topic.

(3) Training presentation material (slides, word documents, etc.).

(4) Copy of training reference material (product manuals to be used, etc.).

(5) Schematic of the training equipment to be used with model numbers on each component.

(6) A description of the measurement devices to measure training effectiveness (quizzes, programming exercises, course exam).

(7) Instructor's name and resume with an emphasis on experience in presenting training programs.

b. Submit the following within 2 weeks of training completion:

(1) List of attendees.

(2) Performance scores on the assessment devices.

2. Startup Testing Plan: Submit a start up testing plan for each unique system.

a. The purpose of a startup test is to demonstrate the "completeness" of the physical tasks associated with installation and the physical performance of the components.

b. For each task on the startup test checklist, the plan shall require the technician to enter his or her initials and the date the test was completed along with any recorded data such as voltages, offsets or tuning parameters. Any deviations from the submitted installation plan shall also be recorded.

c. Required elements of the startup testing include:

(1) Measurement of voltage sources, primary and secondary

(2) Verification of proper controller power wiring.

(3) Verification of component inventory when compared to the submittals.

(4) Verification of labeling on components and wiring.

(5) Verification of connection integrity and quality (loose strands and tight connections).

(6) Verification of bus topology, grounding of shields and installation of termination devices.

(7) Verification of point checkout.

(1) Each I/O device is landed per the submittals and functions per the sequence of control.

(2) Analog sensors are properly scaled and a value is reported.
(3) Binary sensors have the correct normal position and the state is correctly reported.
(4) Analog outputs have the correct normal position and move full stroke when so commanded.
(5) Binary outputs have the correct normal state and respond appropriately to energize/de-energize commands.

(8) Documentation of analog sensor calibration (measured value, reported value and calculated offset).

(9) Documentation of Loop tuning (sample rate, gain and integral time constant).

d. Submit at least four weeks prior to any scheduled start-up tests.

3. Startup Testing Report

a. Startup testing reports shall be submitted on a per system basis.

b. Startup testing reports shall be the documented results of the executed startup testing plans.

4. Performance Verification Testing Plan: Submit a verification plan for each system.

a. The purpose of a performance verification test is to ensure that the system performs according to the sequence of control. For each end device that is controlled, there shall be a series of step by step cause and effect tests to verify each aspect of the sequence of control. A sample sequence of control with corresponding performance verification test is included as Appendix B.

b. A performance verification test shall also be defined for the operator interaction with the system. Test elements shall be written to require the verification of all operator interaction tasks including, but not limited to the following.

(1) Graphics navigation.

(2) Trend data collection and presentation.

(3) Alarm handling, acknowledgement and routing.

(4) Time schedule editing.

(5) Application parameter adjustment.

(6) Manual control.

(7) Report execution.

(8) Automatic backups.

(9) Web Client access.

c. Submit at least 4 weeks prior to the scheduled execution of the test.

5. Performance Verification Testing Report

a. Performance Verification Testing reports shall be submitted on a per system basis.

b. Performance Verification Testing reports shall be the documented results of the executed performance verification testing plans.

D. Submittals After Construction

1. The following is a list of post construction submittals that shall be updated to reflect any changes during construction and re-submitted as “As-Built”.

a. System architecture drawing.

b. Layout drawing for each control panel.

c. Wiring diagram for each control panel.

d. Wiring diagram for individual components.

e. System flow diagram for each controlled system.

f. Instrumentation list for each controlled system.

g. Sequence of control.

h. Binding map.

2. Operation and Maintenance Manuals

a. Operations and Maintenance Manuals shall consist of two parts. The information shall be in three ring binders with tabs and a table of contents. Diagrams shall be on 11” by 17” foldouts. If color has been used to differentiate information, the printed copies shall be in color.

b. Part I: Information common to the entire system. This shall include but not be limited to the following.

(1) Product manuals for the key software tasks.

(1) Operating the system.
(2) Administrating the system.
(3) Engineering the operator workstation.
(4) Application programming.
(5) Engineering the network.
(6) Setting up the web server.
(7) Report creation.
(8) Graphics creation.
(9) All other engineering tasks.

(2) System Architecture Diagram.

(3) List of recommended maintenance tasks associated with the system servers, operator workstations, data servers, web servers and web clients.

(1) Define the task.
(2) Recommend a frequency for the task.
(3) Reference the product manual that includes instructions on executing the task.

(4) Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.

(5) Licenses, guarantees, and warranty documents for equipment and systems.

(6) Submit one copy for each building, plus two extra copies.

c. Part II: Information common to the systems in a single building.

(1) System architecture diagram for components within the building annotated with specific location information.

(2) As-built drawing for each control panel.

(3) As-built wiring design diagram for each control panel.

(4) As-built wiring design diagram for all components.

(5) Installation design details for each I/O device.

(6) As-built system flow diagram for each system.

(7) Sequence of control for each system.

(8) Binding map for the building.

(9) Product data sheet for each component.

(10) Installation data sheet for each component.

(11) Submit two copies for each building and two extra copies.

3. Software

a. Submit a copy of all software installed on the servers and workstations.

b. Submit all licensing information for all software installed on the servers and workstations.

c. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.

d. Submit all licensing information for all of the software used to execute the project.

e. All software revisions shall be as installed at the time of the system acceptance.

4. Firmware Files

a. Submit a copy of all firmware files that were downloaded to or pre-installed on any devices installed as part of this project.

b. This does not apply to firmware that is permanently burned on a chip at the factory and can only be replaced by replacing the chip.

c. Submit a copy of all application files that were created during the execution of the project.

d. Submit a copy of all graphic page files created during the execution of the project.

e. Submit a copy of all secondary graphic files such as bitmaps, jpegs, etc. that were used in the creation of the graphic pages.

1.8 DEFINITION OF TERMS

A. Appendix A to this document contains a list of terms and/or abbreviations with their definitions. These terms are used throughout this document.

B. Additional definitions of terms or acronyms are included on the contract drawings and in other sections of this specification.

C. In the preparation of submittals and reports, the contractor shall use these definitions and abbreviations. Any terms or abbreviations used by the contractor in submittals and reports that have not been defined in this section shall be defined by the contractor in the first section of the submittal or report prior to their use.

1.9 OWNERSHIP OF PROPRIETARY MATERIAL

A. The Owner shall retain all rights to software for this project.

B. The Owner shall sign a copy of the manufacturer’s standard software and firmware licensing agreement as a condition off this contractor. Such license shall grant use of all programs and application software to the Owner as defined by the manufacturer’s license agreement, but shall protect the manufacturer’s rights to disclosure of Trade Secrets contained within such software.

C. The licensing agreement shall not preclude the use of the software by individuals under contract to the owner for commissioning, servicing or altering the system in the future. Use of the software by individuals under contract to the owner shall be restricted to use on the owner’s computers and only for the purpose of commissioning, servicing, or altering the installed system.

D. All project developed software, files and documentation shall become the property of the Owner. These include but are not limited to:

1. Server and workstation software
2. Application programming tools
3. Configuration tools
4. Network diagnostic tools
5. Addressing tools
6. Application files
7. Configuration files
8. Graphic files
9. Report files
10. Graphic symbol libraries
11. All documentation

1.10 QUALIFICATIONS

A. Bids by wholesalers, distributors, mechanical contractors and non-franchised contractors shall not be acceptable.

B. All work described in the plans and specifications shall be installed, wired and commissioned by factory certified technicians qualified for this work and in the regular employment of the control system manufacturer's local office.

C. A local office is defined as a corporate branch office or an independently owned office with a current contractual agreement with the system manufacturer that allows the office to purchase, install and service the manufacturer's products.

D. The local office shall be a full service facility within 100 miles of the project site. The local office shall be staffed with engineers and technicians trained on the installation, commissioning and service of energy management.

1.11 QUALITY ASSURANCE

A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids for all of the Codes and Standards listed in Section 1.2 of this specification.

B. Performance criteria for components, collections of components, communications and system performance are described in Section 2.0 Products.

C. Key quality assurance programs shall include the following which are described in Section 3.0, Execution.

1. Startup Testing
2. Performance Verification Testing
3. System Performance Testing

1.12 APPROVED MANUFACTURERS: THE FOLLOWING ARE THE APPROVED CONTROL SYSTEM MANUFACTURERS

A. TAC Andover

B. Substitutions - Not Allowed

PART 2 PRODUCTS

2.1 SYSTEM ARCHITECTURE

A. The DDC system shall include system servers, operator work stations, a data server, a web server and field level devices installed in an architecture that consists of two layers, the TCP/IP layer and the field bus layer.

B. The TCP/IP layer connects all of the buildings on a single Wide Area Network (WAN) isolated behind the campus firewall. Fixed IP addresses for connections to the campus WAN shall be used for each device that connects to the WAN.

C. Connection points for the system servers, operator workstations, data server and web server shall be at the IP layer of the system architecture.

D. The system architecture shall include an IP to BACnet router or Building Controller to connect a field bus to the WAN. A building control system shall have one or more IP connections to the WAN based on the number of connected devices and wiring considerations.

E. For the new building control systems, each field bus shall consist of one channel with no more than 100 connected devices. If there are more than 50 connected devices, the channel shall be divided into two segments separated by a physical layer repeater.

F. For the new building control systems, the programmable process controllers, supervisory logic controllers, application specific devices and protocol translators shall be installed on the field busses.

2.2 NETWORKING

A. IP NETWORK: All devices that connect to the WAN shall be capable of operating at 10 megabits per second and 100 megabits per second.

B. FIELD BUS:

1. The wiring of components shall use a bus or daisy chain concept with no tees, stubs or free topology.

2. Each field bus shall have a termination device at both ends of each segment.

C. IP TO FIELD BUS ROUTER

1. These devices shall perform layer 3 routing of packets onto the IP network.

2. These devices shall be configurable locally without the use of the IP network (local cross over cable connection is acceptable) and configurable via the IP network.

3. These devices shall be configurable as routers such that only data packets from the field bus devices that need to travel over the IP level of the architecture are forwarded.

D. BUILDING CONTROLLER

1. These devices shall perform layer 3 routing of packets onto the IP network.

2. These devices shall be configurable locally without the use of the IP network (local cross over cable connection is acceptable) and configurable via the IP network.

3. These devices shall be configurable as routers such that only data packets from the field bus devices that need to travel over the IP level of the architecture are forwarded.

4. These devices shall provide the following support for the field bus devices that are connected below the building controller.

a. Time schedules

b. Trend logging

c. Alarm message generation and handling

5. These devices may provide supervisory logic support for the field bus devices that are connected below the building controller.

6. These devices may have physical inputs and outputs and provide process control for systems using these inputs and outputs.

7. If a building controller has physical inputs and outputs, it shall also comply with all of the requirements for programmable process controllers.

E. PHYSICAL LAYER REPEATERS (PLR)

1. PLRs are required to connect two segments to create a channel.

2. Physical layer repeaters shall be installed in an enclosure. The enclosure may be in an interstitial space.

2.3 FIELD BUS DEVICES

A. GENERAL REQUIREMENTS

1. Devices shall incorporate a service pin which, when pressed, will cause the device to broadcast its 48 bit node ID and its program ID over the network. The service pin shall be distinguishable and accessible.

2. Devices shall have a light indicating that they are powered.

3. Devices shall be locally powered. Link powered devices are not acceptable.

4. Application programs shall be stored in a manner such that a loss of power does not result in a loss of the application program or configuration parameter settings.

B. PROGRAMMABLE PROCESS CONTROLLERS (PPC)

1. The key characteristics of a PPC are:

a. They have physical input and output circuits for the connection of analog input devices, binary input devices, pulse input devices, analog output devices and binary output devices. The number and type of input and output devices supported will vary by model.

b. They may or may not provide support for additional input and output devices beyond the number of circuits that are provided on the basic circuit board. Support for additional I/O may be by additional circuit boards that physically connect to the basic controller or by a stand alone device that communicates with the basic controller via the field bus.

c. The application to be executed by a PPC is created by an application engineer using the vendor’s application programming tool.

d. PPCs Shall support embedded time schedules. When time schedules are not embedded in a PPC, an occupancy command shall be an input network variable when time based control is required by the sequence of control.

e. PPCs Shall support trend data storage with periodic upload to the data server. When trend data storage is not supported, the variables to be trended shall be broadcast over the field bus to another device that does support embedded trend data storage.

f. PPCs Shall support the initiation of an alarm message to the system server. When alarm message initiation is not supported, binary alarm indication variables shall be broadcast over the field bus to another device that does support the initiation of alarm messages to the system server.

2. Analog Input Circuits

a. The electrical signals from analog sensors shall be processed by an analog to digital (A/D) converter chip. The output of the A/D chip shall then be processed mathematically to produce data within the controller that has the required engineering units.

b. The resolution of the A/D chip shall not be greater than 0.01 Volts per increment. For an A/D converter that has a measurement range of 0 to 10 VDC and is 10 bit, the resolution is 10/1024 or 0.00976 Volts per increment.

c. For non-flow sensors, the control logic shall provide support for the use of a calibration offset such that the raw measured value is added to the (+/-) offset to create a calibration value to be used by the control logic and reported to the Operator Workstation (OWS).

d. For flow sensors, the control logic shall provide support for the use of an adjustable gain and an adjustable offset such that a two point calibration concept can be executed (both a low range value and a high range value are adjusted to match values determined by a calibration instrument).

e. For non-linear sensors such as thermistors and flow sensors the PPC shall provide software support for the linearization of the input signal.

3. Binary Input Circuits

a. Dry contact sensors shall wire to the controller with two wires.

b. An external power supply in the sensor circuit shall not be required.

4. Pulse Input Circuits

a. Pulse input sensors shall wire to the controller with two wires.

b. An external power supply in the sensor circuit shall not be required.

c. The pulse input circuit shall be able to process up to 50 pulses per second.

5. True Analog Output Circuits

a. The logical commands shall be processed by a digital to analog (D/A) converter chip. The 0% to 100% control signal shall be scalable to the full output range which shall be either 0 to 10 VDC, 4 to 20 milliamps or 0 to 20 milliamps or to ranges within the full output range (Example: 0 to 100% creates 3 to 6 VDC where the full output range is 0 to 10 VDC).

b. The resolution of the D/A chip shall not be greater than 0.04 Volts per increment or 0.08 milliamps per increment.

6. Pulse Width Modulation Outputs with PWM transducers

a. The controller shall be able to generate incremental pulses as small as 0.1 seconds.

7. Binary Output Circuits

a. Single pole single throw or single pole double throw relays with support for up to 230 VAC and a maximum current of 2 amps.

b. Voltage sourcing or externally powered triacs with support for up to 30 VAC and 0.8 amps.

8. Program Execution

a. Process control loops shall operate in parallel and not in sequence unless specifically required to operate in sequence by the sequence of control.

b. The sample rate for a process control loop shall be adjustable and shall support a minimum sample rate of 1 second.

c. The sample rate for process variables shall be adjustable and shall support a minimum sample rate of 1 second.

d. The sample rate for algorithm updates shall be adjustable and shall support a minimum sample rate of 1 second.

e. The application shall have the ability to determine if a power cycle to the controller has occurred, and the application programmer shall be able to use the indication of a power cycle to modify the sequence of control immediately following a power cycle.

9. Local Interface: The controller shall support the connection of a portable interface device such as a laptop computer or vendor unique hand-held device. The ability to execute any tasks other than viewing data shall be password protected. Via this local interface, an operator shall be able to:

   a. Adjust application parameters.

   b. Edit time schedule parameters if time schedules are embedded in the controller.

   c. Execute manual control of input and output points.

   d. View dynamic data.

   e. View alarm messages if alarm messaging is embedded in the controller.

10. Each PPC shall have a network interface port that allows for an external device to connect to the FTT-10A network by plugging into the port. This port shall be built into the controller.

C. SUPERVISORY LOGIC CONTROLLERS (SLC)

1. The key characteristics of an SLC are:

   a. The application to be executed by as SLC is created by an application engineer using the vendor's application programming tool.

   b. SLCs shall support embedded time schedules. When time schedules are not embedded in a SLC, an occupancy command shall be an input network variable when time based control is required by the sequence of control.

   c. SLCs shall support trend data storage with periodic upload to the data server. When trend data storage is not supported, the variables to be trended shall be broadcast over the field bus to another device that does support embedded trend data storage.

   d. SLCs shall support the initiation of an alarm message to the system server. When alarm message initiation is not supported, binary alarm indication variables shall be broadcast over the field bus to another device that does support the initiation of alarm messages to the system server.

2. Program Execution

   a. Control algorithms shall operate in parallel and not in sequence unless specifically required to operate in sequence by the sequence of control.

   b. The sample rate for algorithm updates shall be adjustable and shall support a minimum sample rate of 1 second.

   c. The application shall have the ability to determine if a power cycle to the controller has occurred and the application programmer shall be able to use the indication of a power cycle to modify the sequence of control immediately following a power cycle.

3. Local Interface: The controller shall support the connection of a portable interface device such as a laptop computer or vendor unique hand-held device. The ability to execute any tasks other than viewing data shall be password protected. Via this local interface, an operator shall be able to:

   a. Adjust application parameters.

   b. Edit time schedule parameters if time schedules are embedded in the controller.

c. Execute manual control of input and output network variables.

d. View dynamic data.

e. View alarm messages if alarm messaging is embedded in the controller.

4. Each SLC shall have a network interface port that allows for an external device to connect to the FTT-10A network by plugging into the port. This port shall be built into the controller.

5. Programmable process controllers with un-used I/O may be used as supervisory logic controllers provided they meet all other requirements.

6. Supervisory logic controllers shall have support a minimum of 200 input network variables and 70 output network variables.

a. The SNVT for each of the 200 input network variables shall be selectable.

b. The SNVT for each of the 70 output network variables shall be selectable.

c. For the input and output network variables there shall not be any limitations as to the SNVT selected. (Example: SNVT_temp_p can only be used on 10 input network variables.)

D. APPLICATION SPECIFIC DEVICES (ASD)

1. ASD shall have fixed function configurable applications.

2. If the application can be altered by the vendor's application programming tool, the device is a programmable controller and not an application specific device.

3. Each ASD shall have a network interface port that allows for an external device to connect to the network by plugging into the port. This port shall be built into the controller.

E. PROTOCOL TRANSLATORS

1. Protocol translators shall convert the BACnet, Modbus or proprietary variables to/from the third party device to network variables.

2. The application in a protocol translator shall include minimum send time and send on delta parameters for each reported variable to avoid data storms from the protocol translator.

2.4 SENSORS AND INSTRUMENTATION: SEE APPENDIX C.

2.5 OUTPUT DEVICES, VALVES AND DAMPERS: SEE APPENDIX D.

2.6 MULTI-FUNCTION DEVICES: SEE APPENDIX E.

2.7 DATA SERVERS, WEB SERVERS, DDC SYSTEM SERVERS AND WORKSTATIONS

A. Hardware Requirements

1. General: The following minimum requirements apply to the system servers, data server, web server and operator workstations.

a. 3GHz Pentium Core Duo2 processor with 4 GB of RAM

b. Serial port, parallel port and 4 USB ports

c. 10/100 MBS Ethernet NIC

d. 500 GB Hard Disk

e. DVD/CD-RW drive

f. High resolution (minimum 1280 by 1024), 21 inch flat panel display

g. Optical mouse and full function keyboard

h. Audio sound card and speakers

B. Software Requirements

1. General: The following software with license agreements shall be provided.

2. Operator Workstations (Owner Provided PC)

a. Microsoft Windows XP Professional Operating System

b. Microsoft Office Professional Edition, latest edition

c. DDC System Operator Workstation Application(s) , latest revision

d. Any other software required to deliver the specified performance.

2.8 DDC SYSTEM SOFTWARE

A. System Servers: Software to provide the following functionality makes up the DDC System Server Application Software.

1. The system server shall manage the collection of data from a specific set of hardware devices and make that data available to the operator workstations and web server.

2. The system server shall manage the uploading of trend log data and transfer of this data to the data server.

3. For large systems with multiple system servers, each managing a portion of the hardware environment, a system server shall be able to send and receive data from other system servers that are part of the total system. Example: A demand control command from a controller under System Server # 1 is uploaded by System Server # 1 and then passed to System Server # 2 over the IP. System Server # 2 shall then pass the demand control command down to the controller where the command is required to execute the sequence of control.

4. The system architecture shall support up to 20 system servers.

5. The system server shall receive alarm messages from the hardware environment and distribute these messages to alarm files, printers, and email accounts as programmed. The received alarm shall cause trend data to be collected and reports to be automatically generated. Operator workstation software does not have to be running for these actions to take place.

6. The system server shall manage the execution of scheduled reports. Operator workstation software does not have to be running for reports to be written to the hard disk.

7. The system server software shall run as a service under the operating system for automatic start up after a power cycle of the system server computer.

B. Operator Workstations: Software to provide the following functionality makes up the DDC System Operator Workstation Application Software.

1. Data Presentation: Data shall be presented in the following formats.

a. Points lists with dynamic presentation of data. The operator shall be able to create custom point lists with data that originates from multiple devices. A point may be dynamic data from a controller or a configuration parameter to be written to a controller by the operator.

b. Graphic pages with dynamic presentation of data on a visual diagram that represents a building, a floor plan, a cross section of a mechanical system or a table of data.

c. Graphical presentation of historical trend log data plotted against time.

d. Graphical presentation of real time trend data plotted against time.

e. Alarm Presentation

(1) Unless restricted by a reduction in viewing authority, an operator shall be able to view alarms for all systems in a single alarm list.

(2) Custom alarm views configured for select categories of alarms shall present only the alarms specified.

(3) Alarm messages shall include identifying information and the signal value or state at the time of the alarm.

f. Event Presentation

(1) Unless restricted by a reduction in viewing authority, an operator shall be able to view an event log that chronologically captures all activity created by the system and operator actions.

(2) Custom event views for select categories of events shall present only the events specified.

g. Time Schedules

(1) Each time schedule shall have the ability to issue a minimum of 10 start and 10 stop commands for the week. The requirements for start and stop commands may be different for each day of the week.

(2) Each time schedule shall also include a holiday component where a holiday is identified by the date and duration (one day, two days, etc.). The time schedule shall support a unique set of start and stop commands for each holiday. The time schedule shall support a minimum of 20 holidays per year. Holiday schedules shall take precedence over standard schedules during the holiday period. Holidays that are date specific shall roll over from year to year without operator programming action.

(3) There shall be a mechanism to link a master time schedule editor at an OWS to multiple time schedules in various ATS devices (or Building Controllers). Once linked, whenever the master time schedule is changed at an OWS, the new time schedule parameters shall be automatically downloaded to all of the linked time schedules. This concept shall apply to both standard schedules and holiday schedules.

h. The system shall support a configuration that:

(1) Causes the system to go into standby mode (user is logged out but the current screen is still displayed) after a specific period of inactivity.

(2) Causes an automatic system logout after a specific period of inactivity.

2. Data Source

a. An operator workstation shall present data from all of the system servers.

b. The system architecture shall allow a minimum of 50 operator workstations per system if so specified on the drawings.

3. Operator Access And Privileges

a. There shall be a minimum of four privilege levels

(1) System Administrator

(1) No limitations
(2) Only level that can assign or delete users and assign or modify privileges.

(2) Engineer

(1) View data in any format.
(2) Acknowledge alarms.
(3) Inhibit alarms.
(4) Exercise control actions.
(5) Edit the presentation of data.
(6) Modify the system.

(3) Operator

(1) View data in any format.
(2) Acknowledge alarms.
(3) Exercise control actions.

(4) Viewer

(1) View data in any format.

b. The level assigned to a specific user shall be the maximum level that can be used anywhere in the system. The software shall provide the capability to reduce a user's level from his or her maximum level to a lower level on a per building or system basis.

c. Signing on to the system shall require a user name and password. When the password is typed in, it shall not be shown on the screen.

d. The system shall have the capability of using Windows NT Security logons in lieu of DDC system logons.

e. The software shall provide the capability to establish groups of users with the same privileges. Once assigned to the group, the user shall automatically have the maximum privileges and the selectively reduced privileges assigned to the group.

f. The software shall provide the capability to set user profiles that enable assigning a specific home graphic page, alarm view, and event view.

4. OPERATOR ACTIONS

a. Given the appropriate authority, an operator from an operator workstation shall be able to:

(1) View all data that is presented in the forms described previously.

(2) Acknowledge alarms.

(3) Manually control both physical input and physical output points.

(4) Edit both independent and master time schedules.

(5) Initiate real time trend logging.

(6) Manually initiate reports.

(7) Initiate system backups for the database and trend log data.

(8) Customize the layout of the operator workstation presentation which shall then be the default for that user.

b. The operator shall be able to execute the above tasks on data from any of the system servers via a single workstation.

c. The system shall support the use of Electronic Signature system wide or on selective tasks (change of values, manual control, trend initiation, etc.)

d. All of the operator workstations shall be operable simultaneously. You will want a license for each operator workstation so that all of the workstations can be used at the same time.

5. Engineering Actions.

a. The software shall, as a minimum, enable the following engineering functions from each of the operator workstations. If the task is followed by the annotation (#) where # is a number, the task must be executable from any combination of the workstations up to that number of workstations simultaneously.

(1) Create graphic pages for the presentation of dynamic data on visual images of buildings or equipment (2).

(2) Create reports for the presentation of historical data in an organized format (2).

(3) Create time schedules (2).

(4) Create trend logs in any of the field level devices and assign a dynamic variable from a field bus device to be trended (2).

(5) Setup long term storage of trend log data on the data server computer and the automatic transfer of the trend log data to the data storage tables in the Sequel database (2).

(6) Create alarm objects in any of the field level devices, assign an alarm variable from a field bus device to initiate the alarm and set up the alarm routing (2).

(7) Configure and bring on-line a newly installed IP to BACnet router in support of an initial or incrementally added building control system (2).

(8) Configure and bring on-line a newly installed field level devices in support of an initial or incrementally added building control system (2).

(9) Create and download applications for programmable devices (2).

(10) Download firmware updates to field level devices.

(11) Import all field level devices into the system so that all input network variables, output network variables and adjustable application parameters can be accessed from any of the operator workstations (2).

(12) Bind variables from one field level device to a second field level device (2).

(13) Bind data from a field bus device under one IP connection to a field bus controller under a different IP connection (2).

(14) Configure the system to create backups of the database and all application and supporting databases on a scheduled basis (2).

(15) Setup user groups and individual users and establish authority levels for each group and individual user (2).

(16) Any additional tasks defined later in this document or required to deliver a fully functional system.

C. Web Server Software

1. This software shall enable operators to access the system from remote computers using only browser software. The software shall allow for a minimum of five (5) concurrent users. Once connected to the system, the operators shall be able to execute the following tasks.

a. View dynamic data in a real time environment in both point list format and in a graphical page format.

b. View and acknowledge alarms.

c. Adjust time schedule parameters.

d. View historical trend data in table and graph formats.

e. View dynamic real time trends in graph format.

f. Run established reports.

g. Manually adjust application parameters.

h. Manually override physical inputs (sensor values) and force a specific value as an input to control logic.

i. Manually override physical outputs (end devices) and force a specific value regardless of the command from the control logic.

2. The Web Delivery System shall have the capability to expand to 50 concurrent web-client users looking at the same hardware environment subject to the purchase of additional software licenses.

3. Enforced acknowledgement/response and electronic signature features shall apply to web delivered information.

D. Graphic Page Creation And Editing

1. The Graphics Editor portion of the Engineering Software shall provide the following minimum capabilities:

a. Create and save symbols.

b. Create and save pages.

c. Group and ungroup symbols.

d. Modify an existing symbol.

e. Modify an existing graphic page.

f. Rotate and mirror a symbol.

g. Place a symbol on a page.

h. Place analog dynamic data in decimal format on a page.

i. Place binary dynamic data using state descriptors on a page.

j. Create motion through the use of gif files.

k. Place test mode indication on a page.

l. Place manual mode indication on a page.

m. Place links using a fixed symbol or flyover on a page.

(1) Links to other graphics.

(2) Links to web sites.

(3) Links to notes.

(4) Links to time schedules.

(5) Links to any .exe file on the operator work station.

(6) Links to .doc files.

n. Assign a background color.

o. Assign a foreground color.

p. Place alarm indicators on a page.

q. Change a symbol color as a function of an analog variable.

r. Change a symbol color as a function of a binary state.

s. Change symbols as a function of a binary state.

t. All symbols used by the contractor in the creation of graphic pages shall be saved to a library file for use by the owner.

E. Event Logging

1. The system shall maintain a log of all operator activity, system messages, alarms and alarm acknowledgments.

2. Operator activity is defined as any action by an operator such as changing the value of an application parameter, modifying a program, acknowledging an alarm, logging on, logging off, etc. Any change in the system caused by operator action shall be part of the log. The log shall include the event, the time of the event, the part of the system affected and an identification of the operator and the OWS from which the change was made.

3. When the event deals with a value change, both the original and new values shall be part of the event record.

4. The Event Log shall be exportable to a report format that is printable.

5. The System Administrator shall be able to archive the event log.

6. The event data shall comply with 21 CFR Part 11 requirements for data integrity.

7. The Event Log shall have a search function with assignable criteria to identify subsets of the event log such as all points placed under manual control, etc.

F. Alarm Generation And Processing

1. Alarm creation is a two part process. The creation of a binary alarm indication is accomplished in a field level device where a binary state of zero shall indicate a normal condition and a binary state of one shall indicate an alarm condition. The binary alarm condition is read within a PPC, SLC, AH Device or Building Controller. The PPC, SLC, AH device or Building shall assign a descriptive message, a category or priority number and a date and time stamp to the alarm and forward the information to the system server according to an alarm routing table.

2. Alarm parameters such as high limits, low limits, time to state, binary alarm conditions are setup within the programming of the field level devices. These parameters shall be viewable and editable in point lists and on configuration graphic pages.

3. The alarm message shall be descriptive.

a. Building identification

b. System identification

c. Device identification

d. Date

e. Time to the second

f. Nature of the alarm

(1) High value

(2) Low value

(3) Fail to start

g. Value or state at the time of the alarm.

4. When the operator acknowledges the alarm, there shall be an opportunity to enter a message that becomes a permanent part of the alarm record recorded in the event log.

5. The system shall support the association of graphic pages, trend charts, reports and text documents with specific alarms.
    a. The operator shall have the ability to configure the system to auto-launch a specific graphic page when the alarm occurs.
    b. The system shall support the assignment of wav files to alarm signals on graphic pages.
    c. The operator shall have the ability to launch a specific trend chart from the alarm window when the alarm occurs.
    d. The operator shall have the ability to launch a specific text document when the alarm occurs.
    e. An associated report shall automatically execute and write to the hard disk on the OWS when the alarm occurs. Configurations options shall include overwriting the previous report or creating a new file.
6. The system shall use selectable multiple colors on alarm messages for each of the following conditions:
    a. Alarm condition exists and has not been acknowledged
    b. Alarm condition has returned to normal but was never acknowledged
    c. Alarm condition exists and has been acknowledged.
7. When an alarm condition no longer exists and has been acknowledged, it shall no longer be displayed in the alarm viewer but it shall be permanently recorded in the event list.
8. The Alarm Routing Table shall support the following:
    a. Multiple operators (based on OWS login) at any time.
    b. Specific operators (based on OWS login) at particular times (to include always as a choice).
    c. Pagers
    d. Email addresses via simple mail transfer protocol (SMTP; RFC 821)
    e. Permanent comprehensive system wide alarm file
    f. Specific alarm file based on a building or equipment identification
    g. One or more alarm printers at any time
    h. Specific alarm printers at specific times
    i. Rerouting of alarms to a backup receiver when an acknowledgement has not been entered into the system within a specified time.
9. The system shall have a default audible indicator generated by the computer when an alarm is received.
10. Once an alarm is acknowledged at one OWS, it shall display as acknowledged at all operator workstations.
11. An operator shall be able to select multiple alarms for single action acknowledgement.
12. There shall be the ability to disable alarms and display all disabled alarms in a separate alarm view.
13. The OWS alarm viewer shall be able to display the last 100 active alarms. If there are more than 100 active alarms, as alarms are acknowledged and removed from the viewer, older alarms shall be viewable to keep the viewer showing the last 100 active alarms until there are less than 100 active alarms.

G. Trends

1. Real Time Trends:

a. At each OWS the operator shall be able to initiate a real time trending instance of up to 20 variables simultaneously.

b. The polling interval setting shall be adjustable down to a rate of every second.

c. The data for each instance shall be presented on a single graphical display that automatically updates with each new data collection cycle.

d. The graphical presentation shall plot the variables on the Y axis and time on the X axis.

e. A minimum of two Y axis scales shall be available.

f. The operator shall have the ability to set the range on each Y axis scale or let the scales auto range to cover the range of the values being trended.

g. Each element of data on the graphical display must be labeled by name or by a unique color. If color is used, a color legend must be included on the graph.

h. The operator shall be able to open up to five instances simultaneously for a total of 100 points being trended at one time.

i. An operator shall be able to print an instance of real time data.

j. The system shall be capable of trending any variable in the system.

k. The operator shall be able to save pre-configured instances of real time trending that can be initiated with simple point and click actions.

l. The system shall provide the ability to expand the graphical presentation to full screen.

2. Historical Data Collection:

a. Historical trend data shall be collected by field level devices and periodically uploaded to the data storage PC.

b. The trend log objects in the field level devices shall have the capacity to store 300 samples per variable. When the 301st sample is collected, the 1st sample shall be discarded.

c. The field level devices shall be configured to request an upload of data when the number of samples is not greater than 180. Uploads may be configured to occur at a greater frequency.

d. Initiation of historical data collection shall be configurable.

(1) By manual operator intervention in a point and click manner.

(2) By a user adjustable time schedule or date.

(3) Triggered by a binary status variable (when the fan status is on, start the trend of the mixed air temperature).

(4) The system shall be capable of trending any variable in the system.

e. The status and capacity of the trend logs in the field devices shall be viewable from the operator workstation.

3. Historical Data Presentation:

    a. An OWS shall have the capability to present the historical data for a variable in a tabular presentation of the values along with the date and time of the sample. The time period for the values to be presented shall be user adjustable.

    b. An OWS shall have the capability to present the historical data for a variable in a graphical presentation of the values plotted against time and date.

    c. The graphical presentation capabilities for historical trends shall equal those described above for real time trends.

    d. The operator shall be able to save pre-configured instances of historical trending that can be initiated with simple point and click actions.

    e. The operator shall be able to print the tabular presentations and graphical presentations of historical trend data.

    f. The system shall provide the ability to expand the graphical presentation to full screen.

4. The data collection, storage, retrieval and presentation system shall provide the features necessary for the owner to achieve certification under 21 CFR Part 11. The key issue is the integrity of the data, the ability to verify that the data has not been modified after collection by the system.

H. Application Programming

1. The application programming tool may be based on Line Programming or Graphical Programming concepts.

2. If the application programming is object based and graphical:

    a. There shall be an off-line simulation capability.

    b. There shall be the ability to view dynamic data displayed on the object diagram in real time.

3. There shall be self checking for errors in programming to be used by the programmer.

4. Key functions that must be supported are:

    a. Timer functions to include Delay Off, Delay On and Sample Rate Support

    b. Interval timer

    c. Math functions to include Addition, Subtraction, Multiplication, Division, Exponentiation, Trigonometric Functions and Logarithmic Functions (base 2 and base 10)

    d. If-Then-Else Instructions (also referred to as switching logic)

    e. Look up tables with a minimum of 100 entries, with and without extrapolation

    f. Bit Wise Logic

    g. Sample and hold binary

    h. Sample and hold analog

    i. Latch on and latch off functions with resets

    j. Input network variable definition

    k. Output network variable definition

    l. Sensor measurement definition

    m. End device control definition

n. Logic functions to include And, Or, Not and Exclusive Or

o. Detection of a power cycle

p. Common function support (standard objects in graphical programs and subroutines in line programs). As a minimum the common functions shall include:

(1) PID with analog output

(2) PID with tri-state outputs

(3) Enthalpy from temperature and relative humidity

(4) Optimum start stop based on occupancy schedule, temperature, set point and outside air temperature.

(5) Polynomial equation

q. Search function.

I. Report Creation

1. The operators shall be able to extract historical data from the data collection files and present the data in a Microsoft Excel format. All of the data in the log shall be exportable to include the date, time and values

2. The number of trend logs that can be inserted into a single Excel Workbook shall not be limited by the OWS software.

3. The operators shall be able to pre-configure reports for manual execution or automated execution.

4. The OWS shall be able to auto execute any report based on:

a. A time schedule

b. An alarm trigger

c. The status of a binary point (state=1, execute the report)

5. The operators shall be able to pre-configure the destination of the report:

a. OWS screen

b. Write to file on the hard drive

c. Send to a printer

6. The generation of a report shall not interrupt the use of the OWS by the operator, that is, it shall execute in the background.

J. Network Configuration Software

1. Network Configuration Software shall be accessible from any operator workstation.

2. This software may be a separate software tool, multiple software tools or the functions may be integral to the engineering software.

a. Functions that must be supported are:

(1) Addressing of field level devices

(2) Establishing data flow from device to device

(3) The ability to query a field bus and identify all installed devices by domain number, subnet number and node number.

3. If configuration of event driven communication is a function of the network configuration tool (in lieu of the application programs), the tool shall provide the capability to select the binding services used. See the definition of terms section for a discussion of binding services.

2.9 ENCLOSURES AND WEATHER SHIELDS

A. Enclosures shall meet the following minimum requirements:

1. Outdoors: Enclosures located outdoors shall meet NEMA 250 Type 4 requirements.

2. Mechanical and Electrical Rooms: Enclosures shall meet NEMA 250 Type 1 requirements.

3. All Other Locations: Enclosures shall meet NEMA 250 Type 1 requirements.

B. Weather shields shall meet the following minimum requirements:

1. They shall prevent the sun from directly striking the sensor.

2. They shall provide sufficient ventilation so that the sensing element measures the ambient conditions of the surroundings.

3. They shall prevent rain from directly striking or dripping onto the sensor.

4. When installed near outside air intake ducts, they shall be installed such that normal outside air flow does not cause rainwater to strike the sensor.

5. They shall be unpainted aluminum or they shall be white galvanized steel aluminum or PVC.

2.10 WIRE CABLE AND TRANSFORMERS: SEE APPENDIX F.

2.11 HVAC CONTROL HARDWARE IDENTIFICATION

A. Automatic Control Valve Tags

1. Use metal tags with a 2-inch minimum diameter, fabricated of brass, stainless steel or aluminum. Attach the tags with a chain of the same material.

2. For lubrication instructions, use linen or a heavy duty shipping tag.

3. Tag the valves with identifying number and system.

4. Prepare a list of all tagged valves showing location, floor level, tag number and use. Organize the list by system. Include in all maintenance manuals.

B. Wire Tags: All multi-conductor cables in all pull boxes and terminal strip cabinets shall be tagged.

C. Conduit Tags: Provide tagging or labeling of all conduits so that it is readily observable which conduit was installed or used in implementation of this work.

D. Panels and Control Devices

1. Control Panels (Enclosures) shall be labeled.

2. All sensors, controllers and controlled devices shall also be labeled.

3. Where physical space permits, the labels shall be made of black lamicoid sheet with white lettering. They shall be affixed to the panel or device by screws if possible or glue if screws are not feasible. If physical space does not permit the use of labels with readable text, tags shall be used.

4. Identification on the labels or tags shall match the identification documented on the submittals/as-builts.

PART 3 EXECUTION

3.1 EXAMINATION

A. The contractor shall verify that systems are ready to receive work.

B. The beginning of installation implies that the contractor accepts the existing conditions.

C. The contractor shall thoroughly examine the project plans for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.

D. The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.

E. The contractor shall examine the drawings and specifications for other parts of the work, and if head room or space conditions appear inadequate or if any discrepancies occur between the plans for work under this contract and the plans for the work of others, the discrepancies shall be reported to the Engineer and the contractor shall obtain written instructions for any changes necessary to accommodate the work under this contract with the work of others.

3.2 PROTECTION

A. The contractor shall protect against and be liable for damage to work and to material caused by the contractor's work or employees.

B. The contractor shall be responsible for work and equipment until inspected, tested, and accepted.

C. The contractor shall be responsible for protecting materials awaiting installation.

D. The contractor shall close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site

1. The contractor shall assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will possibly interfere with work of other trades. If installation with coordination causes interference with work of other trades, the contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with work in the same area and with work that is dependent upon other work to facilitate mutual progress.

B. Submittals: See Section 01-3000.

C. Test and Balance

1. The contractor shall provide the Test and Balance Contractor a single set of necessary tools to interface with the control system for testing and balancing.

2. The contractor shall provide a minimum of 4 hours of training on the use of the interface tools.

3. The contractor shall provide a qualified technician to assist with the testing and balancing of one system controlled by a programmable controller and the first twenty terminal units.

D. Network

1. The contractor shall allocate space in each control panel for the installation of IP connection jacks by the network contractor.

2. In control panels where the IP to BACnet router or Building Controller is installed, the contractor shall provide sufficient space for two ports.

3.

E. Life Safety

1. Duct smoke detectors required for air handler shutdown are provided under Section . The contractor shall interlock the smoke detectors to the air handlers for shutdown as required by the sequence of control in Section 23 0993.

2. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 23. Fire and smoke damper control is provided under Division 26.

F. Coordination with other controls specified in other sections or divisions: Other sections and/or division of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. The contractor shall coordinate his integration of these devices as follows.

1. The contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this section and those provided under other sections or divisions of this specification.

2. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.

3. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

G. Site Meetings

1. The project manager shall attend a weekly site coordination meeting that will be attended by all of the contractors involved in the project.

2. The contractor shall allocate at least 3 hours for this meeting.

3. At the first meeting of each month, the status report submittals will be delivered.

3.4 GENERAL WORKMANSHIP

A. The contractor shall install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

B. The contractor shall provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. The contractor shall install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the Nations Electrical Code (NEC).

D. The contractor shall verify the integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 FIELD QUALITY CONTROL

A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification.

B. The contractor shall continually monitor the field installation for code compliance and quality of workmanship.

C. The Contractor shall have work inspected by local and/or state authorities having jurisdiction over the work.

3.6 EXISTING EQUIPMENT

A. Interconnecting control wiring shall be removed by the contractor and become the property of the contractor unless specifically noted or shown to be reused.

B. Interconnecting pneumatic tubing shall be removed by the contractor and become the property of the contractor unless specifically noted or shown to be reused.

C. The contractor shall remove existing control panels and deliver to the owner.

D. Unless otherwise directed, the contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers or actuators. Should the contractor find existing equipment that requires maintenance, the engineer is to be notified immediately.

E. The contractor may reuse any existing temperature sensor wells in piping for temperature sensors. These wells shall be modified as required for proper fit of the new sensors.

F. Where indicator gauges remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Replace defective gauges as necessary.

G. Where existing thermostats are to be replaced, remove existing room thermostats and deliver to the owner unless otherwise noted. Patch and finish holes and marks left by the removal process to match existing walls.

H. Where existing electronic sensors and transmitters are no longer required, remove and deliver them to the owner unless otherwise noted.

I. Where existing controllers and auxiliary electronic devices are no longer required, remove and deliver them to the owner unless otherwise noted.

J. Remove existing pneumatic controllers and auxiliary devices and deliver them to the owner unless otherwise noted.

K. Where existing damper actuators, linkages and appurtenances are replaced or no longer required, remove and deliver them to the owner unless otherwise noted.

L. Where existing control valves are replaced or no longer required, remove and deliver them to the owner unless otherwise noted.

M. Patch all existing surfaces of walls, cabinets, insulation, etc. when the surfaces have been disturbed by the removed of existing equipment.

N. At the owner's request, items to be delivered to the owner shall be properly disposed of. Hazardous materials shall be disposed of as required by Division 02.

3.7 WIRING

A. All control and interlock wiring shall comply with national and local electrical codes and Division 26 of this specification. Where the requirements of this section differ from those in Division 26, the requirements of this section shall take precedence.

B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway according to NEC and Division 26 requirements.

C. Low voltage wiring shall meet NEC Class 2 requirements. Sub-fuse low voltage power circuits as required to meet Class 2 current limits.

D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL Listed for the intended application.

E. All wiring in mechanical, electrical, or service rooms, or where subject to mechanical damage, shall be installed in raceway at levels below 10 feet.

F. The contractor shall not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

G. The contractor shall not install wiring in raceway containing tubing.

H. Where Class 2 wiring is exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 10 foot intervals.

I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.

J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire to wire connections shall be at a terminal block.

K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

L. Maximum allowable voltage for control wiring shall be 120 Volts. If only higher voltages are available, the contractor shall provide step-down transformers.

M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.

N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain the fire rating at all penetrations.

O. The size of raceway and size and type of wire shall be the responsibility of the contractor, in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.

P. Include one pull string in each raceway that is 1 inch in diameter or larger.

Q. Use coded conductors throughout with conductors of different colors.

R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.

S. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway, to maintain a minimum clearance of 6 inches from high-temperature equipment such as steam pipes or flues.

T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

U. Adhere to Division 26 requirement where raceway crosses building expansion joints.

V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.

W. The contractor shall terminate all control and/or interlock wiring and shall maintain updated as-built wiring diagrams with terminations identified at the job site.

X. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 3 feet in length and shall be supported at each end. Flexible metal raceway less than ½ inch electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.

Y. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with coupling according to code. Terminations must be made with fittings at boxes and ends not terminating in boxes shall have bushings installed.

3.8 COMMUNICATION WIRING

A. The contractor shall adhere to the items listed in the previous section on WIRING.

B. The contractor shall install all cabling in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

C. The contractor shall not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

D. When a cable enters or exits a building, the contractor shall install a lighting arrestor between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.

E. The contractor shall install all runs of communication wiring with un-spliced lengths when that length is commercially available.

F. The contractor shall label all communication wiring to indicate origination and destination data.

G. The contractor shall ground coaxial cable according to NEC regulations on "Communications Circuits, Cable, and Protector Grounding."

H. When shielded wiring is use, the contractor shall ground the shield only once for each continuous segment of cable. The grounding location shall be at the end of the segment that is most readily accessible.

3.9 SENSORS

A. Where temperature sensors are being placed in location where pneumatic control previously were located and hole in wall is not covers with new temperature sensor provide with over size back plate.

B. The contractor shall install sensors according to the manufacturer's recommendations.

C. The contractor shall mount sensors rigidly and adequately for the environment within which the sensor operates.

D. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

E. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

F. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

G. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across the duct. Each bend shall be supported with a capillary clip. Provide 1 foot of sensing element for each square foot of coil area.

H. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in the thermal wells.

I. Install outdoor air temperature sensors on the north wall, complete with a sun shield at the designated location.

J. Differential air static pressure sensors:

1. For supply duct static pressure, pipe the high pressure tap to a duct probe that measures at a 90 degree angle to flow (to measure only the static pressure and not the effects of velocity). Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor if one is installed or to the plenum if a building static pressure sensor is not installed.

2. For return duct static pressure, pipe the high pressure tap to a duct probe that measures at a 90 degree angle to flow (to measure only the static pressure and not the effects of velocity). Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor if one is installed or to the plenum if a building static pressure sensor is not installed.

3. For building static pressure, pipe the low-pressure port of the sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.

4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.

5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels and not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without the use of ladders or special equipment to the maximum extent possible.

6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shutoff valves installed before the tee.

K. Annular pitot tubes shall be installed so that the total head pressure ports are set-in-line with the pipe axis upstream and the static port facing downstream. The total head pressure ports shall extend diametrically across the entire pipe. Annular pitot tubes shall not be used where the flow is pulsating or where pipe vibration exists.

3.10 FLOW SWITCHES

A. Airflow Switches

1. Install in horizontal duct runs whenever possible.

2. If a vertical duct run is the only option, then install in a location with an upward airflow.

B. Hydronic Switches

1. Use the correct paddle type for the pipe diameter as described by the switch manufacturer.

2. Adjust the flow switch according to the manufacturer's instructions.

3.11 ACTUATORS

A. Damper actuators shall be provided with all mounting hardware and linkages.

B. Mount and link control damper actuators according to manufacturer's instructions.

C. When spring return actuators are used on normally closed dampers, the seals shall be compressed when the dampers have been closed by the actuator.

D. Damper/actuator combinations shall modulate smoothly from fully closed to fully open and return.

E. Electric/Electronic Damper Actuators

1. Shall be direct-mounted on the damper shaft or jackshaft unless shown as a linkage installation.

2. Shall be mounted following the actuator manufacturer's recommendations.

F. Electric/Electronic Valve Actuators

1. Shall be connected to the valve with adapters approved by the actuator manufacturer.

2. Shall be mounted following the actuator manufacturer's recommendations.

3.12 IP INTERFACE DEVICES

A. Install IP to BACnet routers or Building Controllers for each required connection to the owner's TCP/IP network. Locations are identified on the drawings.

B. The IP to BACnet routers or Building Controller shall be configured and commissioned to ensure that the only data traffic on the TCP/IP is data that is essential for operation of the system. Messages between field devices on the same field bus shall not be allowed to pass onto the TCP/IP network.

3.13 CONTROLLERS

A. Install programmable process controllers, supervisory logic controllers and application specific devices on each field bus to meet the requirements of the sequence of control for all systems.

B. All process control loops for an integral system shall reside in a single controller. Each controllable end device creates one process control loop. Examples of integral systems are:

1. Air handling units

2. Packaged chillers

3. Chillers, excluding pumps and tower

4. Boilers

C. To the maximum extent possible, all process control loops for built up systems shall reside in a single controller. An example is a chiller with its associated chilled water and condenser water pumping systems or a boiler system with steam to hot water heat exchangers. The objective of this requirement is that the contractor shall use large point count, primary controllers in lieu of multiple secondary controllers.

D. Supervisory logic for integral and built up systems may reside in separate supervisory logic controllers with the output commands to the process control loops traversing the field bus to the controllers executing the process control.

3.14 CONTROL DAMPERS

A. Install dampers according to the manufacturer's instructions to operate and to obtain leakage rates specified herein. Adjust the damper linkage such that the damper closes before the actuator is fully closed to assure tight shutoff of the damper.

B. Blank-off and seal around dampers and between dampers and sleeves or frames to eliminate air bypass.

C. For outdoor air damper assemblies, stage the opening of each section to prevent stratification and poor mixing of outside and return air.

3.15 CONTROL VALVES

A. Install in an accessible location, with room for actuator removal and service. Adjust the actuator to provide tight shutoff. Provide valve stem indicator and adjust to indicate proper travel.

B. Where butterfly valves are used, permanently mark the end of the valve shaft to indicate the valve position.

3.16 WARNING LABELS

A. The contractor shall affix permanent warning labels to all equipment that can be automatically started by the DDC system.

1. Labels shall use white lettering, 12 point type or larger, on a red background.

2. The labels shall read: "CAUTION: This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to the OFF position before servicing."

B. The contractor shall affix permanent warning labels to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering, 12 point type or larger, on a red background.

2. The labels shall read: "CAUTION: This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing."

3.17 IDENTIFICATION OF HARDWARE AND WIRING

A. The contractor shall label all wiring and cable, including that within factory-fabricated panels, at each end and within 2 inches of the end of the cable with the DDC address or termination number.

B. The contractor shall label all pneumatic tubing at each end within 2 inches of the end with a descriptive identifier.

C. The contractor shall label or code each point of field terminal strips to show the instrument or item served.

D. The contractor shall label all control panels with minimum ½ inch letters on laminated plastic nameplates.

E. The contractor shall identify all other control components with permanent labels. All plug-in components shall be labeled on both the removable component and the permanently installed base such that it is obvious where the removed component is to be re-installed.

F. The contractor shall label room sensors relating to terminal box or valves with nameplates.

G. Manufacturer's nameplates and UL or CSA labels are to be visible and legible after equipment is installed.

H. All identifiers shall match the as-built documents.

3.18 PROGRAMMING FOR PROGRAMMABLE DEVICES

A. These requirements apply to Building Controllers, programmable process controllers, supervisory logic controllers, automatic time scheduling devices, trend logging devices, alarm handling devices and automatic time schedule switch-over devices.

B. The contractor shall create and download application programs that meet the requirements of the sequence of control, time scheduling requirements, trend logging requirements and alarm handling requirements.

1. The contractor shall use a consistent point naming concept throughout the project that allows for easy transition from building to building and system to system.

2. All time schedules shall be fully configured with weekly schedules and all of the holidays identified by the owner.

3. All trend logs identified in the sequence of control shall be fully configured and operational.

4. All alarm handling shall be fully configured with consistent alarm messages and priorities or category numbers to identify the system from which the alarm originates.

5. All external point values and internal point values identified as in the sequence of control shall be exposed as viewable values .

6. Manual control of all external points (and those internal points requiring manual control) shall be programmed using either the priority override concept or the software switchover concept.

7. For all variables broadcast onto the field bus, event driven communication shall be used to avoid data storms. As a minimum the program shall provide for the send on delta parameter and minimum send time parameter for each output variable.

8. The contractor shall embed into the programs sufficient comment statements to clearly describe each section of the program. This applies to both line programming and graphical programming systems.

9. If graphical programming systems with multiple layers for the functional block diagrams are used, no more than two layers shall be used.

3.19 CONFIGURATION OF APPLICATION SPECIFIC DEVICES

A. Application specific devices shall be configured to meet the sequence of control.

3.20 DEVICE-TO-DEVICE DATA FLOW

A. All device-to-device data flow shall be in place and configured to meet the sequence of control for the new systems and to integrate the existing systems.

B. Appropriate binding services shall be used to ensure that the average bandwidth utilization is less than 30%. The owner reserves the right to conduct network bandwidth testing to ensure this requirement is met.

C. If reducing the number of devices per field bus is required to meet the network bandwidth requirements, all costs of making changes shall be borne by the contractor.

3.21 DISTRIBUTED CONTROL REQUIREMENTS

A. The programmed applications for a single integrated system shall not be distributed over more than one field bus. Examples:

1. A chiller is controlled by a controller on field bus number 1. The controllers that control the pumps and tower shall also be on field bus number 1 as these systems are integrated in their control requirements.

2. Multiple air handling units are controlled by controllers on field bus number 1. The chiller system is controlled by controllers on field bus number 2. The chiller control logic requires the chilled water valve positions from each of the air handling unit controllers. It is acceptable that these related but non-integral systems are controlled by controllers on different field busses.

3.22 SERVERS AND WORKSTATIONS

A. The contractor shall install:

1. Operator work stations (Owner provided PC) with remote web access for up to two concurrent users, as shown on the contract drawings.

B. All required software for fully functional systems shall be installed and configured. The owner shall provide the IP connections and identify the specific rooms where the computers shall be installed.

3.23 OPERATOR WORKSTATIONS

A. Dynamic Data Display

1. Points lists shall be organized on a per field device basis.

2. If the software provides for the sub-division of point data within a field device, the data shall be organized by physical sub-system as a minimum (fan section, mixed air section, etc.).

3. The workstation shall be configured to automatically update values without any action by the operator.

4. Value updates in points lists shall be configured to update at least once every 5 seconds.

5. Binary data shall be configured to display state descriptors (OFF, ON; OPEN, CLOSED; etc.) and not the states of 0 and 1.

6. Analog data shall display with a resolution equal to the resolution defined as part of the SNVT used to transmit the data.

7. Analog data displays shall include engineering units.

8. All text fields associated with a specific element of data shall be filled out to provide the maximum amount of information to the operator.

B. Graphic Pages

1. Hierarchy

a. The organization of graphic pages shall be from a global level down to a very detailed level through a series of links.

b. Linking shall allow the operator to move down the hierarchy, up the hierarchy and laterally within the hierarchy.

2. Hierarchy Outline

a. Site Plan Page: A visual representation of the site (map). One page or multiple linked pages depending on the size of the site plan.

(1) Link to individual building graphic pages.

(2) Display outdoor weather conditions.

b. Utility Management Page: A summary of data on the utility consumption for the site.

(1) Link up to the site plan.

(2) Display

(1) Utility consumption data.
(2) Demand data.
(3) Voltages, currents and power factors.
(4) Demand control actions currently in effect.

(3) Presenting the utility management data may require more than one graphic page to effectively report the data from multiple meters.

c. Building Graphic Page: Typically a picture of the building. One page per building.

(1) Link to floor plans within the building.

(2) Link to central plant graphics where the plant serves the entire building.

(3) Link to delivery systems if the deliver system serves the entire building

(4) Link up to the site plan.

d. Floor Plan Page: This will be a two dimensional plan of a floor area. A minimum of one page per floor per building is required. Where floor plans are large, multiple linked pages are required. For each control zone the value of the controlled parameters shall be displayed. This will typically be lighting status, temperature and relative humidity if relative humidity is a controlled variable.

(1) Link up to the Building page.

(2) Link up to the Site Plan page.

(3) Link to any delivery system that serves the floor plan area (air handling unit is typical).

(4) Link to time schedules that affect the systems that serve the area

(5) Link to a Terminal Unit Summary page where multiple zones on the floor are served by unitary control devices such a VAVs or fan coil units.

(6) Individual control zones shall be identified.

(7) The location of terminal equipment serving each zone shall be shown.

(8) The location of sensors installed in the occupied space shall be shown.

(9) Where room numbers are available, they shall be shown.

e. Central Plant Page: A graphical representation of the equipment that makes up the plant such as chillers, pumps, boilers, towers etc. If the plant is small, this graphic will display the values of process variables and commands to end devices. If the plant is complex this graphic will just contain links to equipment graphics. A page for each plant is required.

(1) Link up to the Building page.

(2) Link up to the Site Plan page.

(3) Link to Central Plant Equipment Component page (chiller, pumps, tower, etc.).

(4) The graphic representation of the equipment shall be 3-dimensional.

(5) Display:

(1) Process variables.
(2) Commands to end devices.
(3) Status of end devices.
(4) Alarm points if this is the only central plant graphic.
(5) Plant status (enabled/disabled).
(6) Demand control status.

(6) Link to any time schedules that affect the operation of the plant.

(7) Link to any pre-configured trend charts associated with the performance of the plant.

(8) Link to a Central Plant Configuration Page.

f. Central Plant Equipment Component: A graphical representation of an element of equipment such as a chiller, pumps, boiler or tower or some combination of all of these. A page for each primary equipment item per plant is required.

(1) Link up to the Central Plant page.

(2) Link up to the Building page.

(3) Link up to the Site Plan page.

(4) The graphic representation of the equipment shall be 3-dimensional.

(5) Display:

(1) Process variables.
(2) Commands to end devices.
(3) Status of end devices.
(4) Alarm points.
(5) Equipment status (enabled/disabled).
(6) Demand control status.

(6) Link to any time schedules that affect the operation of the equipment component.

(7) Link to any pre-configured trend charts associated with the performance of the equipment component.

(8) Link to a Central Plant Configuration Page.

g. Central Plant Configuration Page: On this page the operator is given access to the configuration parameters for the entire plant or a piece of equipment in the plant. Typically, this page presents data in a tabular format. The type of data on this page is not changed frequently, but the operator may wish to view it frequently. One page per plant for small plants and one page per primary equipment item per plant for larger plants are required.

(1) Set Points.

(2) Tuning Parameters.

(3) Calibration Parameters.

(4) Timing Parameters.

(5) Application parameters.

(6) Reset Schedules.

(7) Lead Lag Information.

(8) Time Schedules.

(9) Link up to the Equipment or Central Plant page.

(10) Link up to the Building page.

h. Delivery System Page: A graphical representation of an air or water delivery system such as an air handling unit, roof top air handling unit, computer room air conditioning unit. One page for each delivery system.

(1) If the Delivery System serves a specific floor area, link up to the Floor Area page.

(2) Link up to the Building page.

(3) Link up to the Site Plan page.

(4) Link to the Central Plant page if the Delivery System is served by a Central Plant.

(5) If the Delivery System supplies multiple terminal devices, link to a Terminal Unit Summary page.

(6) Link to a Delivery System Configuration page.

(7) The graphical representation of the equipment shall be 3-dimensional and represent the true physical characteristics of the installed system.

(8) Display:

(1) Process variables.
(2) Commands to end devices.
(3) Status of end devices.
(4) Status of different modes (economizer on/off, mechanical cooling enabled/disabled, occupied/unoccupied).
(5) Alarm points.

(9) Link to any time schedules that affect the system operation.

(10) Link to any pre-configured trend charts for the system.

i. Delivery System Configuration Page: On this page the operator is given access to the configuration parameters for the delivery system. Typically, this page presents data in a tabular format. The type of data on this page is not changed frequently, but the operator may wish to view it frequently. One page per delivery system is required.

(1) Display:

(1) Set Points.
(2) Tuning Parameters.
(3) Calibration Parameters.
(4) Timing Parameters.
(5) Application parameters.
(6) Reset Schedules.
(7) Lead Lag Information
(8) Time Schedules.

(2) Link up to the Delivery System page.

(3) Link up to the Building page.

(4) Link up to the Site Plan page.

j. Terminal Equipment Summary Page: On this page the dynamic data and set points that are associated with multiple terminal units are presented in a tabular format. The objective is to present a summary of terminal unit performance for an area of the facility. One page is required for each group of terminal units. In the tabular data, do not use less than 12 pt font size. Multiple linked pages may be used if there are a large number of terminals served by one delivery system.

(1) Display in the table:

(1) Process variables.
(2) Set points for each process.
(3) Command to each end device.
(4) Status of each end device.
(5) Load factors such as terminal load for a VAV terminal unit.

(2) Link to the page for each Terminal Unit.

(3) Link up to the Delivery System page.

(4) Link up to the Floor Plan page.

(5) Link up to the Building page.

(6) Link up to the Site Plan page.

k. Terminal Unit Page: A graphical representation of a terminal unit such as a VAV terminal or fan coil terminal. One page for each terminal unit.

(1) Link up to the Terminal Summary page.

(2) Link up to the Floor Plan page.

(3) Link up to the Building page.

(4) Link up to the Site Plan page.

(5) The graphic representation of the equipment shall be 3-dimensional and shall represent the actual installed terminal unit (if the VAV does not have a fan, a fan should not be shown, etc.).

(6) Display

(1) Process variables.
(2) Command to end devices.
(3) Status of end devices.
(4) Set points for each process.
(5) Modes (auto, heat, cool, etc.).
(6) Capacity indicators (terminal load, %heat, %cool, etc.).
(7) Reset schedules.
(8) Occupancy commands and status.
(9) Alarm points.

3. For all points on a graphic page that are subject to being under manual or test mode, the display shall indicate when test mode or manual mode has been applied to the point.

4. Graphic Page Requirements

a. The sequence of control defines the buildings and all of the equipment items for which graphic pages shall be constructed as described above.

b. The contractor shall develop similar additional graphic pages to be defined during the construction period as follows:

(1) Up to five additional pages per building.

(2) Up to twenty additional global pages.

C. User Groups

1. The contractor shall configure four users groups, one for each level of security. The group names shall be representative of the “names” below:

    a. Administrators

    b. Engineers

    c. Operators

    d. Viewers

D. Users

1. The contractor shall configure two users in each user group. The names and passwords shall be representative of the “names” below:

    a. Administrators Group

        (1) Admin1 / Admin1

        (2) Admin2 / Admin2

    b. Engineers Group

        (1) Engr1 / Engr1

        (2) Engr2 / Engr2

    c. Operators Group

        (1) Oper1 / Oper1

        (2) Oper2 / Oper2

    d. Viewers Group

        (1) View1 / View1

        (2) View2 / View2

2. With the exception of the Viewers Group, these users shall not be added to the system until all testing has been completed and the system has been accepted. The contractor shall accept all responsibility for actions that result from the unauthorized issuance of user names and passwords above the level of viewers prior to system acceptance unless specifically instructed to do so in writing by the owner.

3. The system shall provide access to two concurrent users.

E. Alarm Processing

1. All alarms required by the sequence of control shall be fully configured for delivery to the operator workstations and the alarm files.

2. All alarms required by the sequence of control shall be fully configured for delivery to five email accounts as designated by the owner.

3. All alarms required by the sequence of control shall be fully configured for delivery of text messages to five phone numbers as designated by the owner.

4. A common alarm file shall be established to receive alarms from all of the field devices.

5. A separate alarm file shall be established on a per building basis to receive just the alarms from that building.

6. The alarm messages shall be descriptive and include as a minimum:

    a. System identification

    b. Date

c. Time to the second

d. Nature of the alarm such as high value, low value, or fail to start.

7. The system shall be configured to send an alarm message on return to normal.

8. All users shall receive all alarms.

F. Reports

1. The sequence of control includes the requirements for variables to be trended. The data server is setup to collect all of this data. The operators have the ability to look at the historical trend data on a log by log basis or in a graphical format as needed. It can be very beneficial to the owner for performance assessments or energy management to have a set of standard reports that analyzes the data and puts it in a format to drive management decisions. Typical examples are:

a. Run time reports on equipment

b. Performance deviation reports that compare actual performance with specified performance. An example would be the average deviation from set point for space temperatures, discharge air temperatures on air handling units, etc.

c. Equipment efficiency reports such as measurements on the KW per TON for a chiller over time.

2. In this section of the specification, a description of the reports to be prepared should be described. The contractor is best qualified to set these reports up during construction rather than leave this responsibility to the owner after acceptance.

3.24 CONTROL SYSTEM CHECKOUT AND TESTING

A. The contractor shall furnish all labor and test apparatus required to execute the start up testing plan. Key tasks to be executed and documented in the start up testing report include:

1. Verification of all primary and secondary voltages.

2. Verification that power wiring for all devices conforms to manufacturer’s instructions.

3. Verification that all labeling is in place.

4. Inspection of wiring for loose strands and tight connections.

5. Verification of field bus topology, grounding of shields (if used) and installation of termination devices.

6. Verification that each I/O device is landed per the submittals and functions per the sequence of control.

a. Analog sensors shall be properly scaled and a value reported to the OWS.

b. Binary sensors shall have the specified normal position and the state is reported to the OWS.

c. Analog outputs have the specified normal position and move full stroke when so commanded.

d. Binary outputs have the specified normal state and respond to energize/de-energize commands.

7. Analog sensors have been calibrated with high quality instrumentation suitable for the sensor being calibrated.

a. The instruments shall display a current (12 month) NIST traceable calibration sticker. Associated instrument calibration certificates shall be made available within 24 hours of a request.

b. The measured value, reported value, and the calculated offset that was entered into the database shall be recorded.

c. The calibration criteria shall be:

(1) Space Temperature:+/- 0.4 degrees F

(2) Air Temperature:+/- 0.5 degrees F

(3) Fluid Temperature:+/- 0.5 degrees F

(4) Air Flow Rate:+/- 5 %

(5) Liquid Flow Rate:+/- 5 %

(6) Differential Pressure:+/- 3 %

(7) Gauge Pressure:+/- 5%

(8) Relative Humidity:+/- 3 % relative humidity

(9) CO2:+/- 2 %

8. Loop Tuning

a. The contractor shall tune all P, PI and PID control loops.

b. The loop tuning criteria shall be a stable control loop where the average error over 15 minutes and 30 samples shall be less than:

(1) Space Temperature:+/- 0.75 degrees F

(2) Air Temperature:+/- 1.50 degrees F

(3) Air Humidity:+/- 5 % relative humidity

(4) Chilled Water Temp:+/- 1.00 degrees F

(5) Hot Water Temp:+/- 1.00 degrees F

(6) Duct Pressure:+/- 0.2 inches w.g.

3.25 PERFORMANCE VERIFICATION TESTING

A. The contractor shall furnish all labor and test apparatus required to execute the Performance Verification testing plan. Key tasks to be executed and documented in the Performance Verification testing report include:

1. Performance Verification of each element of the sequence of control such as the following:

a. Basic control loops

b. Supervisory logic

c. Alarm generation, latching and releases

d. Power failures

e. Abnormal conditions

f. No flow conditions

g. Equipment failures

2. Performance Verification for operator tasks from an OWS such as the following:

a. Graphics navigation

b. Trend data collection and presentation

c. Alarm handling, acknowledgement and routing.

d. Time schedule editing

e. Application parameter adjustment

f. Manual control of external points

g. Report execution

h. Automatic backups

3. Performance Verification for operator tasks from a web client such as the following:

a. Graphics navigation

b. Trend data presentation

c. Alarm receipt and acknowledgement

d. Time schedule editing

e. Viewing of reports

f. Manual control of external points

4. The contractor shall schedule the performance verification testing with the Owner and Engineer two weeks in advance. The Owner and Engineer shall observe the testing unless they inform the contractor in writing to proceed without observation.

5. The contractor shall provide all personnel and equipment required for executing the tests. This shall include but not be limited to tools, instruments, ladders, lifts, computers, software, cables, etc. The contractor personnel must be competent with and knowledgeable of all project specific systems, hardware and software.

6. All failures to meet the project requirements shall be documented in the performance verification test report along with the corrective actions taken by the contractor. Errors that are corrected on the spot to the satisfaction of the Owner and Engineer do not have to be documented in the report.

7. Errors that require a re-work that does not occur on the spot shall require retesting once corrective action has been taken.

8. The contractor shall provide two weeks notice for retesting of corrected errors.

3.26 COMMISSIONING: REFER TO SECTIONS 01 9113, 01 9114 AND 23 0800

3.27 TRAINING

A. The contractor shall provide training programs for the owner’s personnel.

1. Basic Operator Training

2. System Operation Training

B. The Basic Operator shall be conducted on the installed system.

C. The system operation training shall be conducted using the installed system.

1. The owner shall provide a meeting room with an IP connection.

2. The instructor shall be an engineer from the project team that has in-depth knowledge about the installed system, the sequences, and the structure of the operator workstation presentation software.

3. The contractor shall provide a work station with all the necessary licensed system software to connect to the system server and to operate as a fully functional operator workstation.

D. Basic Operator Training

1. Training shall be provided for up to 5 individuals. The owner will confirm the number to the contractor one month in advance of the training.

2. Refer to Section 23 0800 for training duration.

3. Learning Objectives:

a. Describe the product line system architecture and all of the key hardware components.

b. Describe the software platforms that make up the system.

c. Log on and off the system.

d. Access point data for specific systems.

e. Navigate the graphic pages to view performance data.

f. View and acknowledge alarms.

g. Manually control external I/O points from both point lists and graphics.

h. Adjust application parameters from both point lists and graphics.

i. Edit time schedules from both the tree structure and graphics.

j. View a historical trend log in table format.

k. View a historical trend log in a graphical format.

l. Set up a real time trend log to troubleshoot a typical system.

m. Manually generate a prepared report.

n. View the alarm files

o. View the event log.

p. Use search and filter functions to locate specific data in the alarm viewer and event viewer.

q. Recognize system malfunctions such as a loss of communication or failure to upload data.

r. Using the submittal documents, describe the job layout and location of control components.

s. Using the submittal documents, locate the sequence of control for a specific system.

t. Using the submittal documents, describe the model and characteristics of a specific sensor.

u. Using the submittal documents, describe the model and characteristics of a specific controlled device.

v. Describe the point naming concept used for the system.

E. System Operation Training

1. Training shall be provided for up to 5 individuals.

2. Refer to Section 23 0800 for training duration

a. First session will be approximately two weeks after system acceptance. The objective of this session is a thorough walk through the installed systems.

(1) Review system architecture.

(2) Review point naming concepts.

(3) Access point data from multiple controllers.

(4) Review the graphics navigation scheme.

(5) View historical trend logs.

(6) View real time trend logs.

(7) Review process for adjusting application parameters.

(8) Review process for adjusting time schedule parameters.

(9) Review report presentation system.

(10) Review levels of user authority.

(11) Respond to questions and answers.

b. Sessions two through six will be scheduled in two week intervals. Each session will be one day in length.

(1) The instructor will respond to specific questions from the operators.

(2) Solutions to the student questions will be demonstrated.

END OF SECTION

Section 23 09 93 - Sequence of Operations for HVAC Controls

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

1.2 RELATED REQUIREMENTS

A. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

B. Section 23 09 23 - Direct-Digital Control System for HVAC.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.

2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.

3. Include at least the following sequences:

a. Start-up.

b. Warm-up mode.

c. Normal operating mode.

d. Unoccupied mode.

e. Shutdown.

f. Capacity control sequences and equipment staging.

g. Temperature and pressure control, such as setbacks, setups, resets, etc.

h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.

i. Effects of power or equipment failure with all standby component functions.

j. Sequences for all alarms and emergency shut downs.

k. Seasonal operational differences and recommendations.

l. Interactions and interlocks with other systems.

4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

6. Include schedules, if known.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

1. Label with settings, adjustable range of control and limits.
2. Include flow diagrams for each control system, graphically depicting control logic.
3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
5. Include all monitoring, control and virtual points specified in elsewhere.
6. Include a key to all abbreviations.

D. Points List: Submit list of all control points indicating at least the following for each point.

1. Name of controlled system.
2. Point abbreviation.
3. Point description; such as dry bulb temperature, airflow, etc.
4. Display unit.
5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

E. Designer's Qualification Statement.

F. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.4 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the State in which the Project is located.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 REFER TO DRAWINGS FOR SEQUENCE OF OPERATION FOR EACH PIECE OF EQUIPMENT.

END OF SECTION

Section 23 21 13 - Hydronic Piping

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water and glycol piping, above grade.

C. Goethermal water piping, above grade.

D. Radiant heating piping system.

E. Pipe and pipe fittings for:

1. Heating water piping system.
2. Geothermal water piping system.
3. Pipe hangers and supports.
4. Unions, flanges, mechanical couplings, and dielectric connections.

F. Valves:

1. Globe or angle valves.
2. Ball valves.
3. Butterfly valves.
4. Check valves.

G. Flow controls.

1.2 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

H. ASTM B32 - Standard Specification for Solder Metal; 2020.

I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

K. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2022).

L. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2023a.

M. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2023.

N. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).

O. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

Q. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

R. AWWA C606 - Grooved and Shouldered Joints; 2022.

S. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use grooved mechanical couplings and fasteners in accessible locations.

C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

D. Use non-conducting dielectric connections whenever jointing dissimilar metals.

E. Provide pipe hangers and supports according to ASME B31.9 unless indicated otherwise.

F. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

G. Use globe valves for throttling, bypass, or manual flow control services.

H. Use spring loaded check valves on discharge of pumps.

I. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

J. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Welder Qualifications: Certify according to ASME BPVC-IX.

1.6 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of welders.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.

2. Use non-conducting dielectric connections whenever jointing dissimilar metals.

3. Grooved mechanical joints may be used in accessible locations only.

a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.

b. Use rigid joints unless otherwise indicated.

4. Provide pipe hangers and supports according to ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch ball valves with cap; pipe to nearest floor drain.

2. For throttling, bypass, or manual flow control services, use globe valves.

3. For shut-off and to isolate parts of systems or vertical risers, use ball valves.

2.2 HEATING WATER AND GLYCOL PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.

2. Threaded Joints: ASME B16.3, malleable iron fittings.

3. Grooved Joints:

a. Pipe/Grooved (Standard/Lightwall): Carbon Steel, A-53B/A-106B - Roll or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends to be grooved according to Victaulic current listed standards conforming to ANSI/AWWA C-606.

b. Victaulic Standard Mechanical Couplings, 2 inch (DN50) through 12 inch (DN300): Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. (Gaskets used for potable water applications shall be UL classified according to ANSI/NSF-61 for potable water service.) Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183, minimum tensile strength 110,000 psi (758450 kPa) as provided standard Victaulic.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.

a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.3 GEOTHERMAL WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.

2. Threaded Joints: ASME B16.3, malleable iron fittings.

3. Grooved Joints:

a. Pipe/Grooved (Standard/Lightwall): Carbon Steel, A-53B/A-106B - Roll or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends to be grooved according to Victaulic current listed standards conforming to ANSI/AWWA C-606.

b. Victaulic Standard Mechanical Couplings, 2 inch (DN50) through 12 inch (DN300): Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. (Gaskets used for potable water applications shall be UL classified according to ANSI/NSF-61 for potable water service.) Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183, minimum tensile strength 110,000 psi (758450 kPa) as provided standard Victaulic.

4. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), hard drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
    a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
    b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
4. Joints: Solder lead free ASTM B 32 HB alloy (95-5 tin-antimony) or tin and silver.

2.4 RADIANT HEATING PIPING

A. Polyethylene Pipe: ASTM F876 or ASTM F877, cross-linked polyethylene, 100 psig operating pressure at 180 degrees F.
1. Fittings: Brass and copper.
2. Joints: Mechanical compression fittings.

B. Composite Polyethylene Pipe: Aluminum tube laminated between two layers of high density polyethylene.
1. Fittings: Brass flared compression.
2. Joints: Fittings adapt to copper tubing or copper tube fittings, threaded pipe and fittings, and copper compression fittings.

C. Hose: Composite hose with nitrile liner, braided fiber reinforcing, neoprene cover, 150 psig operating pressure at 205 degrees F.
1. Fittings: Copper.
2. Joints: Nipple with stainless steel clamp.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. Conform to ASME B31.9.

C. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.

D. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

F. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.

G. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

H. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.

I. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

J. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.

K. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

L. Vertical Support: Steel riser clamp.

M. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

N. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

O. Floor Support for Hot Pipe Sizes 6 Inches and Greater: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

P. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

Q. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

R. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

S. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging according to ASME B31.9.

2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:

1. Ferrous Piping: 150 psig malleable iron, threaded.

2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Copper Piping: Bronze.

3. Gaskets: 1/16 inch thick preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.

2. Mechanical Couplings: Comply with ASTM F1476.

3. Housing Clamps: Malleable iron galvanized to engage and lock, designed to permit some angular deflection, contraction, and expansion.

4. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.

5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.

6. When pipe is field grooved, provide coupling manufacturer's grooving tools.

7. Manufacturers:

a. Grinnell Products, a Tyco Business: www.grinnell.com.

b. Victaulic Company: www.victaulic.com.

c. Anvil International

2.7 GLOBE OR ANGLE VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.

2. Conbraco Industries: www.apollovalves.com.

3. Nibco, Inc: www.nibco.com.

4. Milwaukee Valve Company: www.milwaukeevalve.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up To and Including 2 Inches:

1. Bronze body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat, solder ends.

C. Over 2 Inches:

1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.8 BALL VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.

2. Nibco, Inc[<>]: www.nibco.com.

3. Milwaukee Valve Company: www.milwaukeevalve.com.

4. Victaulic Company: www.victaulic.com.

5. Anvil International

6. Uponor; www.uponor.com/en-us

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up To and Including 2 Inches:

1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

C. Over 2 Inches:

1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

2.9 BUTTERFLY VALVES

A. Manufacturers:

1. Hammond Valve: www.hammondvalve.com.

2. Milwaukee Valve Company[<>]: www.milwaukeevalve.com.

3. Victaulic Company: www.victaulic.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.

C. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.

D. Operator: 10 position lever handle.

2.10 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Victaulic Company: www.victaulic.com.

2. Anvil International

3. Titan Flow Control

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

2.11 FLOW CONTROLS

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Griswold Controls: www.griswoldcontrols.com.
4. Taco, Inc: www.taco-hvac.com.
5. Victaulic
6. Anvil International
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. Refer to Section 23 25 00 for additional requirements.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange to drain at low points.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.

G. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

H. Pipe Hangers and Supports:

1. Install according to ASME B31.9, ASTM F708, or MSS SP-58.

2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

5. Provide copper plated hangers and supports for copper piping.

6. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00 .

K. Use eccentric reducers to maintain top of pipe level.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

M. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09 91 23.

N. Install valves with stems upright or horizontal, not inverted.

O. Install pressure independant control valve on all coils 15 GPM and greater.

3.3 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.

2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.

3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.

4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.

5. 3 inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.

6. 4 inch: Maximum span, 12 feet; minimum rod size, 1/2 inch.

7. 6 inch: Maximum span, 14 feet; minimum rod size, 1/2 inch.

8. 8 inch: Maximum span, 16 feet; minimum rod size, 5/8 inch.

B. Hanger Spacing for Steel Piping.

1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.

2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.

3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.

4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.

5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.

6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.

7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

8. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.

9. 8 inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.

END OF SECTION

Section 23 21 13.33 - Ground-Loop Heat-Pump Piping

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ground-coupled heat exchanger and connections to building piping system, serving:

1. Hydronic piping system specified in Section 23 21 13.

1.2 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Piping:

1. Basis of Measurement: By the linear foot (meter).

1.3 REFERENCE STANDARDS

A. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2020.

B. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products; 2022.

C. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2022.

D. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing; 2016.

E. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials; 2021.

F. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter; 2022.

G. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing; 2016a (Reapproved 2022).

H. IGSHPA (GROUT) - Grouting Procedures for GHP Systems; International Ground Source Heat Pump Association; 1991.

I. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe; 2021.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section. Require attendance by all installers involved with site work and HVAC work.

B. This contractor shall apply for and pay fees required by the Minnesota Department of Health.

1. Minnesota Rules, Chapter 4725 "Wells and Borings" establishes the permit application requirements and the standards for the construction, maintenance, and sealing of the vertical heat exchanger.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data, Polyethylene Piping: Provide manufacturer's data for piping and pipe fittings, showing compliance with specified requirements.

1. Provide manufacturer's recommendations for fusion jointing.

2. Include certification of long term hydrostatic basis, or test reports.

C. Product Data, Heat Exchange Fluid: Provide data showing compliance with specified requirements.

1. Provide manufacturer's Material Data Safety Sheets.

D. Product Data, Grout and Slurry: Provide information on thermal conductivity of proposed materials.

E. Shop Drawings: Show complete piping layout, water table, water level, depths of excavation, final depths of piping, backfill placement, point of entrance to building, point of connection to equipment, test point locations, and fittings used for all joints and connections.

F. Samples: Provide one 2-inch length of pipe in selected size.

G. Test Reports, Piping: Indicate test method and results of hydrostatic pressure tests.

H. Record Documents: Record actual locations of all underground piping installed relative to Owner's permanent structure on same property.

I. Operation and Maintenance Data: Provide procedures for pressurizing, charging, and isolation for equipment replacement.

J. It is the responsibility of the Contractor to provide an as-built survey drawings of the wells, piping and appurtenances at no additional cost to the owner. The owner will provide the field survey data. The as-built survey shall detail the location of all wells, piping and appurtenances for

1. future location purposes in the case of repair needs or expansion. At least two corners of the well field shall be tied to a permanent above ground fixture such as existing buildings, property corners, etc. The as-built survey shall be prepared by a licensed Civil Engineer or Land Surveyor and delivered in paper drawings.

K. In addition to the as-built survey requirements, the Contractor also shall provide a permanent marker at each of the outer corners of the bore field area. The marker shall be durable iron monument at least 1/2" in diameter and 24" long buried below the surface. The purpose of these markers is for future identification of the extents of the wells in case of future expansion needs.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience and accredited by IGSHPA.

B. Heat Fusion Technician Certification: IGSHPA training and certification, certified within three years from the date of project commencement.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping and fittings to project site in shipping containers with labeling in place.

1. Verify that labels on piping indicate manufacturer's name, pipe or tube size, and PE cell classification.

2. Verify that piping complies with specifications and is undamaged.

B. Deliver chemicals for heat exchange fluid to project site in unopened shipping containers with labeling in place; comply with local and state regulations.

C. Protect from weather, humidity and temperature variations, dirt and dust, and other environmental contaminants.

D. Store piping capped or plugged until time of installation.

PART 2 PRODUCTS

2.1 HEAT EXCHANGER

A. The ground-coupled heat exchanger has been designed; Contractor is responsible for execution as required in the Contract Documents.

B. Heat Exchanger Configuration: Closed system; polyethylene piping in vertical boreholes located adjacent to building, as indicated on drawings.

1. Pipe Diameter: 1 inch.

2. Borehole Diameter: 4 inches, nominal.

3. Borehole Spacing: 20 feet, minimum.

4. Total Number of Boreholes: 20.

2.2 MATERIALS

A. Pipe: High density polyethylene pipe, type PE3408, PE3608, or PE4710, with minimum ASTM D3350 cell classification of PE345364C.

1. Pipe Used in Vertical Bore Applications: Comply with ASTM D3035 with minimum working pressure rating of 160 psi.

2. Other Pipe of 3 Inches Diameter and Larger: Comply with ASTM D3035 or ASTM F714, with minimum working pressure rating of 100 psi.

3. Other Pipe 1.25 Inches But Less Than 3 Inches In Diameter (Nominal): Comply with ASTM D3035 with minimum working pressure rating of 110 psi.

4. Other Pipe Less Than 1.25 Inches in Diameter (Nominal): Comply with ASTM D3035 with minimum working pressure rating of 160 psi.

5. Long Term Hydrostatic Design Basis: 1600 psi at 73 degrees F, when tested according to ASTM D2837; appropriate listing in current edition of PPI TR-4 will constitute evidence of compliance with this requirement; otherwise, submit independent test results.

6. Joints and Fittings: Polyethylene of same type as pipe, of sizes and types suitable for the pipe being used; use only heat fusion or stab-type mechanical fittings that are quality controlled to provide a leak-free union between piping ends that is stronger than the piping itself. Do not use other barbed fittings or hose clamps.

a. Electrofusion Type Fittings: Comply with ASTM F1055.

b. Butt Fusion Fittings: Comply with ASTM D3261.

c. Socket Type Fittings: Comply with ASTM D2683.

d. Where threaded fittings must be used for connection to equipment or dissimilar piping, use fittings and thread sealant compatible and effective with antifreeze used.

B. Heat Exchange Fluid: Water and antifreeze solution, 30 percent propylene glycol by weight.

C. Detectable Underground Tape: Magnetic detectable conductor in 2 inch wide rot-resistant plastic tape or mesh, brightly colored, imprinted with "Water Line" in large letters.

D. Backfill for Vertical Boreholes: Bentonite.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify location of existing structures and utilities prior to excavation.

B. Verify soil composition and rock depth, if any, before beginning excavation.

C. Protect adjacent structures from the effects of excavation.

D. Verify that layout dimensions are correct and that available land is sufficient for design.

E. Notify Architect of unsatisfactory conditions.

F. Do not proceed with installation until unsatisfactory conditions have been corrected.

G. Coordinate work with site grading, site backfilling, and foundation construction.

3.2 EXCAVATION

A. Excavate according to requirements of authorities having jurisdiction.

B. Remove rock as specified in Section 31 23 16.26.

C. Vertical Boreholes: Drill to depths required.

1. Minimize over-drilling; fill over-drilled areas with backfill or excavated materials.

2. Piping: Assemble heat exchanger piping and test before installation.

D. Trenches: Excavate trenches for piping to lines and grades shown on drawings.

1. Minimize over-excavation; fill over-excavated areas with backfill or excavated materials.

2. Excavate to accommodate grade changes.

3. Maintain trenches free of debris, material, and obstructions that may damage pipe.

4. Piping: Assemble heat exchanger piping and test before backfilling.

3.3 POLYETHYLENE PIPING

A. Join piping and fittings using heat fusion or electrofusion; do not use solvents, adhesives, or mechanical fittings.

B. Provide flanges or unions to connect heat exchanger piping to equipment or piping of different type; locate all transitions between piping of different types inside the building or otherwise accessible (i.e. above grade).

C. Keep dirt, water, and debris out of pipe assemblies; cap or plug open ends until connected to adjacent piping.

D. Do not bend piping to shorter radius than recommended by pipe manufacturer; do not kink piping; use elbow or other fittings for sharp bends.

E. Partially backfill radius bends in narrow trenches by hand to ensure that piping is properly supported and to prevent kinking.

F. Test piping to be installed in boreholes after assembly but before installation in boreholes; re-cap tested assemblies before installation.

G. Test piping to be installed in trenches after installation but before backfilling.

H. Testing: Perform hydrostatic test on all piping; portions of assembled piping may be tested separately.

1. Prior to testing, isolate piping from all connections to building systems.

2. Flush all dirt and debris using potable water flowing at twice the normal operating flow rate for a minimum of four hours or until no dirt or debris is visible, whichever is longer.

3. Plug or cap piping.

4. Pressurize piping to 150 psi for 30 minutes and monitor.

5. If there is any pressure loss or visible leakage, identify leak and repair according to manufacturer's recommendations.

6. Repeat test until there is no loss of pressure for the duration of the test.

I. Where piping passes through foundation walls, provide sleeves sealed with non-hardening, waterproof material.

J. After connection of piping to building systems and installation of equipment served by heat exchanger, fill piping with heat exchange fluid and pressurize.

1. Water Temperature of 70 to 90 degrees F: Pressurize to 20 to 30 psi, minimum.

2. Water Temperature of 40 to 50 degrees F: Pressurize to 40 to 50 psi, minimum.

3. If adequate flooding of circulating pump can be accomplished without pressurization and pump manufacturer approves, pressurization is not required.

4. After pressurization, remove charging valve handles, or plug ports, whichever is applicable, and deliver handles to Owner.

5. Install system label at charging valves, indicating:

a. Heat exchange fluid, including antifreeze type and concentration.

b. Service date.

c. Company name.

d. Company phone number and responsible person.

3.4 BACKFILLING

A. Install in compliance with local authorities having jurisdiction.

B. Vertical Boreholes: Backfill after pipe installation according to IGSHPA (GROUT) - IGSHPA Grouting Procedures for GHP Systems.

C. Trenches:

1. Backfill trenches after pipe has been installed and tested, using fill free of rocks and other debris.

2. Install detectable tape continuously 6 inches above top of all buried pipe.

3. Backfill and compact using the procedures specified in Section 31 23 16.13.

4. Backfill to original grades with sufficient overfill to allow for settlement.

D. Protect piping from displacement.

3.5 CLEANING

A. Leave adjacent paved areas broom clean.

B. Clear debris, including excess backfill and excavated dirt and rock, from heat exchanger area.

3.6 PROTECTION

A. Protect area during excavation from excess runoff and erosion.

B. Protect pipe protrusions from damage until connections to building systems are installed.

END OF SECTION

Section 23 21 14 - Hydronic Specialties

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Suction diffusers.

F. Pump connectors.

G. Pressure-temperature test plugs.

H. Balancing valves.

I. Pump suction fittings.

J. Relief valves.

K. Pressure reducing valves.

L. Glycol system.

M. Glycol specialties.

N. Glycol system maintenance.

1.2 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

C. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Maintenance Contract.

F. Project Record Documents: Record actual locations of flow controls.

G. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 EXPANSION TANKS

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.
4. Grundfos: www.grundfos.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: Welded steel, tested and stamped according to ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psi.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.2 AIR VENTS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Type:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

D. Washer Type:

1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.3 AIR SEPARATORS

A. Coalescing Air/Dirt Separators:

1. Tank: Fabricated steel tank; tested and stamped according to ASME BPVC-VIII-1; for 150 psi operating pressure and 270 degrees F maximum operating temperature; subject to the requirements of the application and the manufacturer's standard maximum operating conditions.
2. Coalescing Medium: Provide structured copper, stainless steel, or _____ medium filling the entire vessel to suppress turbulence and provide air elimination efficiency of 100 percent free air, 100 percent entrained air, and 99.6 percent dissolved air at the installed location.
3. Air Vent: Integral float actuated air vent at top fitting of tank rated at 150 psi, threaded to the top of the separator.

4. Inlet and Outlet Connections: Threaded for 2 NPS and smaller; Class 150 flanged connections for 2-1/2 NPS and larger.

5. Blowdown Connection: Threaded.

6. Size: Match system flow capacity.

2.4 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.

2. Green Country Filtration: greencountryfiltration.com.

3. WEAMCO: www.weamco.com.

4. Anvil International, Inc[<>]: www.anvilintl.com.

5. Titan Flow Control

6. Victaulic; Model Series 732: www.victaulic.com

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Under:

1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2 inch to 4 inch:

1. Flanged iron body for 175 psi working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

D. Size 5 inch and Larger:

1. Flanged iron body for 175 psi working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.5 SUCTION DIFFUSERS

A. Manufacturers:

1. ITT Bell & Gossett: www.bellgossett.com.

2. Anvil International, Inc: www.anvilintl.com.

3. Victaulic Company of America: www.victaulic.com.

4. Armstrong Pumps

5. TACO

6. Titan Flow Control

7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh start up screen, and permanent magnet located in flow stream and removable for cleaning.

C. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

D. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2.6 PUMP CONNECTORS

A. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.

1. Maximum Allowable Working Pressure: 150 psig at 120 degrees F.

2. End Connections: Same as specified for pipe jointing.

3. Provide necessary accessories including, but not limited to, swivel joints.

2.7 PRESSURE-TEMPERATURE TEST PLUGS

A. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

B. Application: Use extended length plugs to clear insulated piping.

2.8 BALANCING VALVES

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.

2. ITT Bell & Gossett: www.bellgossett.com.

3. Taco, Inc: www.taco-hvac.com.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Size 2 inch and Smaller:

1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.

2. Metal construction materials consist of bronze or brass.

3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.

C. Size 2.5 inch and Larger:

1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged, grooved, or weld end connections.

2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.

3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.

2.9 RELIEF VALVES

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.

2. ITT Bell & Gossett: www.bellgossett.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.10 PRESSURE REDUCING VALVES

A. Operation: Automatically feeds make-up water to the hydronic system whenever pressure in the system drops below the pressure setting of the valve. Refer to Section 23 21 13.

B. Materials of Construction:

1. Valve Body: Constructed of bronze, cast iron, brass, or iron.

2. Internal Components: Construct of stainless steel or brass and engineered plastics or composition material.

C. Connections:

1. NPT threaded: 0.50 inch or 0.75 inch.

2. Soldered: 0.50 inch.

D. Provide integral check valve and strainer.

E. Maximum Inlet Pressure: 100 psi.

F. Maximum Fluid Temperature: 180 degrees F.

G. Operating Pressure Range: Between 10 psi and 25 psi.

2.11 GLYCOL SYSTEM

A. Tank Pumping System

1. Manufacture

a. Neptune Chemical Pump Co., Inc:

b. Axiom

c. ITT

2. Pump mounted under the 50 gal tank, tank lid hinged, stand, PVC suction valve, Poly "Y" strainer with plug in cord.

3. Pipe system to discharge of expansion tank, include ball valve, check, and pressure gauge.

B. Expansion Tank: Closed type with vent fitting with air separator, and automatic air vent.

C. Glycol Solution:

1. Geothermal Systems

a. Inhibited propylene glycol and water solution mixed 30 percent glycol - 70 percent water, suitable for operating temperatures from 10 degrees F to 250 degrees F. Burst Protection to -30F.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties according to manufacturer's instructions.

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved drain and hose connection on strainer blow down connection.

G. Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.

H. Support pump fittings with floor mounted pipe and flange supports.

I. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

K. Pipe relief valve outlet to nearest floor drain.

L. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

M. Clean and flush glycol system before adding glycol solution. Refer to Section 23 2500.

N. Feed glycol solution to system through make-up line with backflow preventer, pressure regulator, venting system high points.

O. Perform tests determining strength of glycol and water solution and submit written test results.

3.2 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of glycol system for one year from date of Substantial Completion at no extra charge to Owner.

C. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Report findings in detail in writing, including analysis and amounts of glycol or water added.

D. Explain corrective actions to Owner's maintenance personnel in person.

3.3 **SCHEDULES**

A. See Schedules on Plans.

END OF SECTION

Section 23 21 23 - Hydronic Pumps

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-rotor inline with VFD

B. In-line circulators.

C. Close coupled vertical in-line

D. Base-mounted pumps.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.3 PERFORMANCE REQUIREMENTS

A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

E. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Pump Seals: One set for each type and size of pump.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright.

C. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

D. Ensure pump operation, at specified system fluid temperatures without vapor binding and cavitation, is non-overloading in parallel or individual operation, and operates to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

E. Ensure pump pressure ratings are at least equal to system’s maximum operating pressure at point where installed but not less than specified.

F. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New pump start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and amperage readings. All proper electrical connections, pump's balance, discharge and suction gauge readings, and adjustment of head, if required. A copy of the start-up report shall be made and sent to both the contractor and to the Engineer.

G. Deliver materials to the site in such a matter as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs if required for handling. Materials damaged by the elements should be packaged in such a matter that they could withstand short-term exposure to the elements during transportation.

1. Store materials in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.

2. Use all means necessary to protect equipment before, during, and after installation.

3. All scratched, dented, and otherwise damaged units shall be repaired or replaced as directed by the Architect Engineer

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL 778 as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Armstrong Pumps Inc: www.armstrongpumps.com.

B. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com.

C. Taco

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 HVAC PUMPS - GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Minimum Quality Standard: UL 778.

C. Base Mounted Pumps: Aligned by qualified millwright.

D. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to Authority Having Jurisdiction as suitable for the purpose specified and indicated.

2.3 IN-LINE CIRCULATORS

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psi maximum working pressure.

B. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 175 psi maximum working pressure.

C. Casing: Cast iron, with flanged pump connections.

D. Impeller: Non-ferrous keyed to shaft.

E. Bearings: Oil-lubricated bronze sleeve.

F. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

G. Seal: Mechanical seal, 225 degrees F maximum continuous operating temperature.

H. Seal: Mechanical seal , 275 degrees F maximum continuous operating temperature.

I. Drive: Flexible coupling.

J. Electrical Characteristics: See Plans.

1. Motor: 1750 rpm unless indicated otherwise; refer to Section 22 05 13.

K. Controls

1. See Specification Section 23 0924 - Direct-Digital Control for HVAC

2. See Schedules on Plans.

2.4 CLOSE COUPLED, VERTICAL IN-LINE CIRCULATORS

A. COMPONENTS

1. The pumps shall be close-coupled, inline for vertical or horizontal installation, in cast iron stainless steel fitted construction specifically designed for quiet operation. Suitable standard operations at 225°F and 175 PSIG working pressure (or optional operations at up to 250°F and 250 PSIG working pressures). Working pressures shall not be de-rated at temperatures up to 250°F. The pump internals shall be capable of being serviced without disturbing piping connections.

2. As an option an EPR/Carbon/Tungsten/Carbide/SS seal (250°F maximum operating temperature), FKM/Carbon/Ceramic/SS seal, or EPR-Silicon Carbide/Silicon Carbide/SS seal may be used in lieu of the standard Buna/Carbon/Ceramic/SS seal (225° F maximum operating temperature).

3. The pumps shall have a solid alloy steel shaft that is integral to the motor. A non-ferrous shaft sleeve shall be employed to completely cover the wetted area under the seal.

4. The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.

5. Pump shall be equipped with an internally flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall have a stainless steel housing, Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face. (As an option, a stuffing box designed may be used in lieu of the traditional internally flushed mechanical seal design. Pump shall be flushed single seal, flushed double seal, or packing gland type seal arrangements.)

6. Pump shaft shall connect to a stainless steel impeller. Impeller shall be hydraulically and dynamically balanced to Hydraulic Institute Standards ANSI/HI 9.6.4.-2016. The allowable residual imbalance conforms to ANSI grade G6.3, keyed to the shaft and secured by a stainless steel locking capscrew or nut.

7. Pump should be designed to allow for true back pull-out access to the pump’s working components for ease of maintenance.

8. Pump volute shall be of a Class 30 cast iron design for heating systems rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges (Optional 250 and 300 PSIG working pressures are available and are 250# flange drilled). Volute shall include gauge ports at nozzles, and vent and drain ports. The volute shall be designed with a base ring matching an ANSI 125# flange that can be used for pump support.

9. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed-coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.

10. Pumps shall conform to ANSI/HI 9.6.3.1-2012 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

11. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.

12. Pump manufacturer shall be ISO-9001 certified.

13. Each pump shall be factory tested and name-plated before shipment.

14. As an option, the pump may include an internal stainless steel casing wear rings.

15. Where noted on schedule pumping equipment may require one or all of the following optional tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or Witnessed Tests.

B. ACCESSORIES

1. Where noted on the schedule, provide one mechanical seal for each model type of primary pump.

2. Where noted on schedule a Bell & Gossett Sediment Separator shall be furnished for installation on the flushing line between the pump discharge flange and the seal area. The sediment separator is installed to increase the overall life expectancy of the seal on inherently dirty systems. The separator shall remove dissolved solids from the flushing medium before the fluid enters the seal area where it can damage and shorten the life of the seal.

3. Where noted on schedule a Bell & Gossett Brazed Plate Heat Exchanger Kit shall be furnished for installation on the flushing line between the pump discharge flange and the seal area. The heat exchanger is installed to increase the overall life expectancy of the seal on high temperature systems (greater than 225° F). The kit shall decrease the temperature of the flushing water being provided to the seal area as a flushing medium to a temperature less than 225° F. Flushing temperatures higher than 225° F can damage and shorten the life of the seal.

C. INTEGRATED VFD WITH SENSORLESS PUMP CONTROL

1. Integrated Pump Controller shall be factory mounted, wired, with a mains disconnect switch and menu-driven graphical interface.

2. Integrated Pump Controller shall provide near unity displacement power factor (cos Ø) without need for external power factor correction capacitors at all loads and speeds using VVC-PWM type integrated controls.

3. Integrated Pump Controller shall include dual DC link reactors equivalent to 5% impedance line reactors, for reduction of mains borne harmonic currents and DC link ripple current to increase DC link capacitor lifetime.

4. Integrated Pump Controller shall have EMI/RFI filters conforming to DIN EN61800-3 to ensure integrated controls meets low emission and immunity requirements.

5. System pressure to be maintained: TAB Contractor shall determine.

6. Integrated Pump Controller orientation shall be specified as [VL1], [VL2], [VL3], [VL4]

7. Integrated Pump Controller shall support direct communication with the building management system (BMS) with built-in support for the following protocols: [Modbus RTU] [BACnet™ MS/TP] [Metasys N2]

8. Integrated Pump Controller shall be provided in an Enclosure rated to UL Type 12 suitable for indoor operation.

9. Integrated Pump Controller shall support Programmable skip Frequencies and adjustable switching frequency for noise and vibration control.

10. Integrated Pump Controller shall provide a temperature controlled Fan for cooling of the heat sink in the back panel.

11. Integrated Pump Controller shall be rated to operate in ambient working conditions of [14°F to +113°F], up to [3300] feet above sea level.

12. Integrated Pump Controller shall provide 2 Analog inputs (current or voltage) and 1 current output.

13. Integrated Pump Controller shall provide 6 programmable Digital inputs with 2 configurable as outputs.

14. Integrated Pump Controller shall support 2 programmable pulse inputs

15. Integrated Pump Controller shall provide 2 programmable relay outputs

16. Integrated Pump Controller shall provide 1 RS485 communication port

17. Integrated Pump Controller system software shall be capable of sensorless control in variable volume systems without need for pump mounted (internal/external) or remotely mounted differential pressure sensor.

18. Integrated Pump Controller Sensorless control shall operate under Quadratic Pressure Control (QPC) to ensure head reduction with reducing flow conforms to quadratic control curve.

19. Integrated Pump Controller shall support a minimum head of 40% of design duty head.

20. Integrated Pump Controller shall provide user adjustable control mode settings and minimum/maximum head set points using built-in programming interface.

21. Integrated Pump Controller integrated control software shall be capable of controlling pump performance for non-overloading power at every point of operation.

22. Integrated Pump Controller integrated control software shall be capable of maintaining flow rate data

2.5 BASE-MOUNTED PUMPS

A. Type: Horizontal shaft, single stage, direct connected, radially or horizontally split casing, for 125 psi maximum working pressure.

B. Casing: Cast iron, or ductile iron with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Stainless Steel, fully enclosed, keyed to shaft.

D. Impeller: Bronze, fully enclosed, keyed to shaft.

E. Bearings: Oil lubricated roller or ball bearings.

F. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

G. Seal: Mechanical seal, 225 degrees F maximum continuous operating temperature.

H. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 250 degrees F maximum continuous operating temperature.

I. Drive: Flexible coupling with coupling guard.

J. Baseplate: Cast iron or fabricated steel with integral drain rim.

K. Performance: See schedule on plans.

L. Electrical Characteristics: See schedule on plans.

2.6 BASE-MOUNTED PUMPS

A. **COMPONENTS**

1. The pumps shall be long coupled, base mounted, single stage, end suction, vertical split case design, in cast iron stainless steel fitted, specifically designed for quiet operation. Suitable standard operations at 225°F and 175 PSIG working pressure or optional operations at up to 250°F and 250 PSIG working pressures. Working pressures shall not be de-rated at temperatures up to 250F. The pump internals shall be capable of being services without disturbing piping connections, electrical motor connections or pump to motor alignment.
2. The pumps shall be composed of three separable components a motor, bearing assembly, and pump end (wet end). The motor shaft shall be connected to the pump shaft via a replaceable flexible coupling.
3. A bearing assembly shall support the shaft via two heavy-duty regreaseable ball bearings. Bearing assembly shall be replaceable without disturbing the system piping and shall have foot support at the coupling end. Pump bearings shall be regreaseable without removal of the bearings from the bearing assembly. Thermal expansion of the shaft toward the impeller shall be prevented via an inboard thrust bearing.
4. The bearing assembly shall have a solid SAE1144 steel shaft. A stainless steel shaft sleeve shall be employed to completely cover the wetted area under the seal.
5. Pump shall be equipped with an internally-flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Application of an internally flushed mechanical seal shall be adequate for seal flushing without requiring external flushing lines. Seal assembly shall have Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.
6. Bearing assembly shaft shall connect to a stainless steel impeller. Impeller shall be both hydraulically and dynamically balanced to ANSI/HI 9.6.4-2016, balance grade G6.3 and secured by a stainless steel locking cap screw or nut.
7. Pump should be designed to allow for true back pull-out allowing access to the pump’s working components, without disturbing motor or piping, for ease of maintenance.
8. A center drop-out type coupling, capable of absorbing torsional vibration, shall be employed between the pump and motor. Pumps for variable speed application shall be provided with a suitable coupling sleeve. Coupling shall allow for removal of pump’s wetted end without disturbing pump volute or movement of the pump’s motor and electrical connections. On variable speed applications the coupling sleeve should be constructed of an neoprene material to maximize performance life.
9. An ANSI and OSHA rated coupling guard shall shield the coupling during operation. Coupling guard shall be dual rated ANSI B15.1 and OSHA 1910.219 compliant coupling guard and contain viewing windows for inspection of the coupling. No more than .25 inches of either rotating assembly shall be visible beyond the coupling guard.
10. Pump volute shall be of a cast iron design for heating systems with integrally cast pedestal volute support, rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. (Optional 250 PSIG working pressures are available and are 250# flange drilled.) Volute shall include gauge ports at nozzles, and vent and drain ports.

11. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Pump and motors shall be factory aligned, and shall be realigned after installation by the manufacturer's representative. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications and conform to standards outlined in EISA 2007.

12. Base plate shall be of structural steel or fabricated steel channel configuration fully enclosed at sides and ends, with securely welded cross members and fully open grouting area (for field grouting). The minimum base plate stiffness shall conform to ANSI/HI 1.3.8.2.1-2019 for grouted Horizontal Baseplate Design standards.

13. Pump shall be of a maintainable design and, for ease of maintenance, should use machine fit parts and not press fit components.

14. The pump(s) vibration limits shall conform to Hydraulic Institute ANSI/HI 9.6.4-2016 for recommended acceptable unfiltered field vibration limits (as measured per ANSI/HI 9.6.4-2016 Figure 9.6.4.2.3.1) for pumps with rolling contact bearings.

15. Pump manufacturer shall be ISO-9001 certified.

16. Each pump shall be hydrostatically tested 1.5 times the maximum rated working pressure and name-plated before shipment.

17. Pump shall conform to ANSI/HI 9.6.3.1-2012 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

B. **ACCESSORIES**

1. Where noted on the schedule provide one mechanical seal for each model type of primary pump.

2. Where noted on schedule pumps shall be provided with internal volute wear rings, galvanized drip pan, or special spacer couplings.

3. Where noted on schedule an EPR/Carbon-Tungsten Carbide seal (250° F maximum operating temperature), or EPR/Silicon Carbide-Silicon Carbide seal should be used in lieu of the Buna standard seal (225° F maximum operating temperature).

4. Where noted on schedule a stuffing box design may be used in lieu of the traditional internally flushed mechanical seal design. Pump shall be flushed single seal or packing gland type seal arrangements.

5. Where noted on schedule, pumping equipment may require a Hydraulic Performance Test per ANSI/HI-14.6-2011, witnessed or non-witnessed test.

6. Where noted on schedule a Bell & Gossett Sediment Separator shall be furnished for installation on the flushing line between the pump discharge flange and the seal area. The sediment separator is installed to increase the overall life expectancy of the seal on inherently dirty systems. The separator shall remove dissolved solids from the flushing medium before the fluid enters the seal area where it can damage and shorten the life of the seal.

7. Where noted on schedule a Bell & Gossett Brazed Plate Heat Exchanger Kit shall be furnished for installation on the flushing line between the pump discharge flange and the seal area. The heat exchanger is installed to increase the overall life expectancy of the seal on high temperature systems (greater than 225°F). The kit shall decrease the temperature of the flushing water being provided to the seal area as a flushing medium to a temperature less than 225°F. Flushing temperatures higher than 225°F can damage and shorten the life of the seal.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. All components shall be installed according to manufacturer's installation instructions.

B. Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow.

C. Furnish and install triple duty valves on the discharge side of all pumps and furnish and install a line size shut-off valve on the suction side of all pumps. Anywhere that 5 straight pipe diameters of pipe cannot be provided on the inlet side of a pump a suction diffuser shall be used to provide appropriate flow distribution into the eye of the pump's impeller.

D. Provide temperature and pressure gauges where and as detailed or directed.

E. On systems where pump seals require flushing water or cooling water for a heat exchanger kit, provide cooling water supply piping and connections as well as the return piping, if required. Piping should be of adequate size to pass required flow rate.

F. Proper access space around a device should be left for servicing the component. No less than the minimum recommended by the manufacturer.

G. Provide an adequate number of isolation valves for service and maintenance of the system and its components.

H. Circulating pump shall have sufficient capacity to circulate the scheduled GPM against the scheduled external head (feet) with the horsepower and speed as scheduled and/or as denoted on the drawings. Motors shall be of electrical characteristics as scheduled, denoted and/or as indicated on the electrical plans and specifications. Pump characteristics shall be such that the head of the pump under varying conditions shall not exceed the rated horsepower of the drive motor.

I. On systems where the final balancing procedure requires the triple duty valve to be throttled more than 25% to attain design flow (on a constant speed pumping system), and no future capacity has been built into the pump, the pump impeller must be trimmed to represent actual system head resistance. The pump provider and engineer of record, based on the balancing contractor's reports, shall determine the final impeller trim diameter.

J. Install foot mounted and base mounted pumps on vibration isolation pad or house keeping pad, via anchor bolts. Set and level and grout in place.

K. All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any loads or stresses being applied to the connections or piping. All piping shall be fitted to the pumps even though piping adjustments may be required after the pipe is installed.

L. On components that require draining, contractor must provide piping to and discharging into appropriate drains.

M. Provide drains for bases and seals, piped to and discharging into floor drains.

N. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturer's instruction and applicable state, federal, and local codes.

O. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the control's contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal, and local codes.

P. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

Q. Power and control wiring shall run in separate channel.

R. Pumps are supplied with an integrated VFD and should not be used with any external VFDs.

S. Pumps shall NOT be run dry to check rotation

T. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

U. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

V. Provide air cock and drain connection on horizontal pump casings.

W. Provide drains for bases and seals, piped to and discharging into floor drains.

X. Check, align, and certify alignment of base-mounted pumps prior to start-up.

Y. Install base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. Refer to Section 03 30 00.

Z. Lubricate pumps before start-up.

AA. Provide side-stream filtration system for closed loop systems. Install across pump with flow from pump discharge to pump suction from pump tappings.

3.3 SCHEDULES

A. Pumps: See Schedules on Plans.

END OF SECTION

Section 23 23 00 - Refrigerant Piping

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Filter-driers.

1.2 REFERENCE STANDARDS

A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers; 2013 (Reapproved 2014).

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

D. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2022, with Errata (2023).

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

F. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

J. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports according to ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.

2. If receiver is provided, install in liquid line leaving receiver.

3. Use line size on leaving side of liquid solenoid valves.

D. Valves:

1. Use service valves on suction and discharge of compressors.

2. Use gage taps at compressor inlet and outlet.

3. Use gage taps at hot gas bypass regulators, inlet and outlet.

4. Use check valves on compressor discharge.

5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

1. Use line size strainer upstream of each automatic valve.

2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.

3. On steel piping systems, use strainer in suction line.

4. Use shut-off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

PART 2 PRODUCTS

2.1 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.

1. Fittings: ASME B16.26 cast copper.

2. Joints: Flared.

C. Pipe Supports and Anchors:

1. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.

2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

5. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

6. Vertical Support: Steel riser clamp.

7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.2 REFRIGERANT

A. Refrigerant: R-410A as defined in ASHRAE Std 34.

2.3 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.4 VALVES

A. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

B. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.5 STRAINERS

A. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.6 FILTER-DRIERS

A. Performance:

1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated according to AHRI 710.

2. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.

3. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.

1. Connections: As specified for applicable pipe type.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties according to manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Unless otherwise specified on plans, Refrigerant pipe routing to be determined by mechanical contractor and installed with engineer approval.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Test refrigeration system according to ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

END OF SECTION

Section 23 25 00 - HVAC Water Treatment

PART 1 GENERAL

1.1 SECTION INCLUDES

A. By-pass (pot) feeder.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Owner furnished treatment equipment.

B. Section 01 60 00 - Product Requirements: Owner furnished treatment equipment.

C. Section 23 21 13 - Hydronic Piping.

D. Section 23 21 14 - Hydronic Specialties.

E. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

D. Manufacturer's Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

E. Certificate: Submit certificate of compliance from Authority Having Jurisdiction indicating approval of chemicals and their proposed disposal.

F. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

G. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Sufficient chemicals for treatment and testing during required maintenance period.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

PART 2 PRODUCTS

2.1 BY-PASS (POT) FEEDER

A. 2 quart quick opening cap for working pressure of 175 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install according to manufacturer's instructions.

3.3 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.

1. Provide minimum of two hours of instruction for two people.

2. Have operation and maintenance data prepared and available for review during training.

3. Conduct training using actual equipment after treated system has been put into full operation.

3.4 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

C. Provide laboratory and technical assistance services during this maintenance period.

D. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

Section 23 31 00 - HVAC Ducts and Casings

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

1.2 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

J. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

1.3 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts according to ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.7 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G60/Z180 coating.

B. Steel Ducts: ASTM A 1008/A 1008M, Designation CS, cold-rolled commercial steel.

C. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

D. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

2. VOC Content: Not more than 250 g/L, excluding water.

3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested according to ASTM E84.

E. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

F. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Other Types: As required.

G. Insulated Flexible Ducts:

1. Multiple layers of aluminum laminate supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.

2.2 DUCTWORK FABRICATION

A. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class.

B. Fabricate and support according to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Provide air foil turning vanes in all 90 degree elbows.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings according to SMACNA (DCS).

F. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.3 DUCT MANUFACTURERS

A. Metal-Fab, Inc: www.mtlfab.com.

B. Sheetmetal Connectors.

2.4 MANUFACTURED METAL DUCTWORK AND FITTINGS

A. Manufacture according to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.

1. Manufacture according to SMACNA (DCS).

C. Round Ducts: Round lockseam duct with galvanized steel outer wall.

1. Manufacture according to SMACNA (DCS).

D. Flexible Ducts: Black polymer film supported by helically wound spring steel wire.

1. UL labeled.

2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts according to SMACNA (DCS).

B. Install according to manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

I. Connect terminal units to supply ducts

J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

K. Connect flexible ducts to metal ducts with draw bands.

3.2 SCHEDULES

A. Ductwork Material:

1. Low Pressure Supply (Heating Systems): Steel..

2. Low Pressure Supply (System with Cooling Coils): Steel.

3. Return and Relief: Steel, Aluminum.

4. General Exhaust: Steel, Aluminum.
5. Outside Air Intake: Steel.

B. Ductwork Pressure Class:
1. Supply (Heating Systems): 2 inch
2. Supply (System with Cooling Coils): 2 inch.
3. Return and Relief: 1 inch.
4. General Exhaust: 1 inch.
5. Outside Air Intake: 1 inch.

END OF SECTION

Section 23 33 00 - Air Duct Accessories

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connections.

H. Smoke dampers.

I. Volume control dampers.

1.2 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

E. Project Record Drawings: Record actual locations of access doors and test holes.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Fusible Links: One of each type and size.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc: www.louvers-dampers.com.

2. Nailor Industries Inc: www.nailor.com.

3. PCI Industries, Inc; Pottorff Brand : www.portorff.com.
4. Ruskin Company: www.ruskin.com.
5. Greenheck.
6. Price
7. Pottorff
8. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.2 DUCT ACCESS DOORS

A. Manufacturers:
1. Acudor Products Inc, a Division of Nelson Industrial Inc: www.acudor.com/#sle.
2. Elgen Manufacturing: www.elgenmfg.com.
3. Nailor Industries Inc: www.nailor.com.
4. Ruskin Company: www.ruskin.com.
5. SEMCO Incorporated: www.semcohvac.com.
6. Ward Industries: www.wardind.com.
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate according to SMACNA (DCS) and as indicated.

2.3 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.4 FLEXIBLE DUCT CONNECTIONS

A. Fabricate according to SMACNA (DCS) and as indicated.

2.5 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc: www.louvers-dampers.com.
2. Nailor Industries Inc: www.nailor.com.
3. PCI Industries, Inc; Pottorff Brand : www.portorff.com.
4. Ruskin Company: www.ruskin.com.
5. Greenheck.
6. Metal Aire
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate according to SMACNA (DCS) and as indicated.

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.

B. Maximum damper leakage rate to meet applicable state Energy Code requirements

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Install smoke dampers and combination smoke and fire dampers according to NFPA 92.

F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

J. Max flex duct length of 5'-0".

END OF SECTION

Section 23 34 23 - HVAC Power Ventilators

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall exhausters.

1.2 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

F. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Fan Belts: One set for each individual fan.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.5 FIELD CONDITIONS

A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Greenheck: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry: www.pennbarry.com.

D. Twin City Fan & Blower: www.tcf.com/sle.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 POWER VENTILATORS - GENERAL

A. Performance Ratings: Determined according to AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. UL Compliance: UL listed and labeled, designed, manufactured, and tested according to UL 705.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

F. Controls

1. See Specification Section 23 0993 - Sequence of Operation for HVAC Controls

2.3 WALL EXHAUSTERS

A. Performance Ratings: See schedule on plans.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

D. Backdraft Damper: Motorized actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Secure wall exhausters with cadmium plated steel lag screws to structure.

C. Extend ducts to wall exhausters into structure. Counterflash duct to wall opening.

D. Provide sheaves required for final air balance.

E. Install backdraft dampers on inlet to roof and wall exhausters.

3.2 SCHEDULES

A. Refer to Schedules on Plans.

END OF SECTION

Section 23 37 00 - Air Outlets and Inlets

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Rectangular ceiling diffusers.

C. Slot ceiling diffusers.

D. Registers/grilles.

1. Ceiling-mounted, egg crate exhaust and return register/grilles.
2. Ceiling-mounted, exhaust and return register/grilles.
3. Ceiling-mounted, supply register/grilles.
4. Wall-mounted, supply register/grilles.
5. Wall-mounted, exhaust and return register/grilles.
6. Wall-mounted, grid core exhaust and return register/grilles.
7. Wall-mounted, linear register/grilles.

E. Louvers.

1.2 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2001.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1. Include complete performance data and descriptive literature including finish and accessory items.

C. Samples: Submit two of each required air outlet and inlet type.

D. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance according to ASHRAE Std 70.

B. Test and rate louver performance according to AMCA 500-L.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hart & Cooley, Inc: www.hartandcooley.com.

B. Price Industries: www.price-hvac.com.

C. Titus: www.titus-hvac.com.

D. Halton; www.haltoncompany.com

E. Nailor

F. Metal Aire

G. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Square, stamped, multi-core diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Fabrication: Steel with baked enamel finish.

C. Color: As indicated.

2.3 HIGH CAPACITY DRUM DIFFUSERS

A. Drum Construction:

1. The outlets shall consist of individually adjustable spread control vanes housed within a rotatable drum.

2. Curved outer drum and vanes shall be extruded of individually adjustable spread control vanes housed within a rotatable drum. Curved outer drum and vanes shall be extruded aluminum, other components shall be steel.

3. The drum pivot mechanism shall incorporate a positive positioning detent device to hold field adjusted drum angles of up to 30° off center. Adjustable vanes are to pivot and maintain blade setting. The border shall be constructed of formed steel with welded, reinforced corners for extra strength.

4. Screw holes shall be countersunk for aesthetic appeal.

B. Color: As shown on drawings.

2.4 CEILING SLOT DIFFUSERS

A. Fabrication: Aluminum extrusions with factory clear lacquer finish.

B. Color: As indicated.

C. Frame: 1-1/4 inch margin with concealed mounting and gasket, mitered end border.

2.5 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Color: As indicated.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.6 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 35 degrees, vertical face.

B. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

C. Color: As indicated.

2.7 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.

B. Fabrication: Grid core consists of aluminum with powder coat finish.

C. Color: As indicated.

D. Frame: 1-1/4 inch margin with countersunk screw mounting.

2.8 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage, 0.0359 inch minimum frames and 22 gage, 0.0299 inch minimum blades, steel and aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: As indicated.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.9 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille with one-way deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory clear lacquer finish.

D. Color: As indicated.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.10 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: As indicated on the drawings.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.11 WALL GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 by 1/2 by 1/2 inch louvers.

B. Fabrication: Aluminum with factory clear lacquer finish.

C. Color: As indicated.

D. Frame: 1-1/4 inch margin with countersunk screw mounting.

E. Frame: Channel lay-in frame for suspended grid ceilings.

F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.12 LINEAR WALL REGISTERS/GRILLES

A. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

B. Fabrication: Aluminum extrusions, with factory baked enamel finish.

C. Color: As indicated.

2.13 LOUVERS

A. Type: 6 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.

B. Fabrication: 16 gage, 0.0598 inch thick galvanized steel welded assembly, with factory prime coat finish.

C. Color: As indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. The contractor shall inspect all equipment for damage upon delivery and shall immediately report damage to the owner and replace or repair such damage to the satisfaction of the owner. Install according to manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. All diffusers and grilles shall be installed tight on their respective mounting surfaces, installed plumb and true with room dimensions, and accurately centered on projections, recesses, windows, ceiling grids, light fixtures, or doors. Provide appropriate frame wherever necessary to adapt to mounting surface.

D. Install items according to manufacturer's instructions.

E. Install diffusers to ductwork with air tight connection.

F. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

G. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 91 23.

3.2 ADJUSTING AND CLEANING

A. All installed materials shall have debris removed and shall be vacuumed clean of dust. Remove any strippable protective coating using manufacturer's recommended method.

END OF SECTION

Section 23 72 10 - Energy Recovery Ventilators

PART 1GENERAL

1.1 WORK INCLUDED

A. Energy Recovery Ventilators (ERV)

1.2 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

E. NFPA 90A&B - Materials for Recirculation Equipment

F. SMACNA - Low Pressure Duct Construction Standard.

1.3 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Sound Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear the AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.]

D. Approval: U.L. Listed and C.S.A. approved.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Division 1.

B. Provide data on wall and roof exhausters, and ceiling and cabinet fans including fan curves with specified operating point clearly plotted. Also submit sound power levels for fan.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Cook

B. Greenheck

C. Renew Aire

D. Ventus

E. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ENERGY RECOVERY VENTILATORS

A. Unit Casing and Frames

1. Unit shall be of internal frame type construction of galvanized steel. Frame and panels shall be G90 galvanized steel. All panels exposed to the weather shall be a minimum of 18 gauge galvanized steel. Unit shall be internally lined with galvanized sheet metal creating a double wall. Where top panels are joined there shall be an overlapping, standing seam to ensure positive weather protection. All metal-to-metal seams shall be factory sealed, requiring no caulking at job site. Provide with Permatector exterior finish for out installation.

2. Unit base to be designed for curb mounting. Unit base shall overhang the curb for a positive seal against water run-off.

B. Insulation

1. Unit casing to be insulated with 1 inch fiberglass. Insulation shall meet requirements of NFPA 90A and tested to meet UL 181 erosion requirements. Insulation to be enclosed in double wall construction.

C. Energy Recovery Wheel

1. Wheel shall be of the enthalpy type for both sensible and latent heat recovery and be designed to ensure laminar flow. Energy transfer ratings must be ARI Certified to Standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program based on ARI 1060. Ratings "according to 1060" without certification are not acceptable. Desiccant shall be silica gel for maximum latent energy transfer. Wheel shall be constructed of lightweight polymer media to minimize shaft and bearing loads. Polymer media shall be mounted in a stainless steel rotor for corrosion resistance.

2. Wheel design shall consist of removable segments for ease of service and/or cleaning. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat capability after cleaning. Wheels with sprayed on desiccant coatings are not acceptable. Wheels with desiccant applied after wheel formation are not acceptable. Energy recovery device shall transfer moisture entirely in the vapor phase.

3. Energy recovery drive belt material shall be high strength urethane and shall be factory installed in a prestretched state, eliminating the need for field belt tension adjustment. Link style belts are not acceptable.

D. Access Doors

1. All components shall be easily accessible through removable doors for exhaust, supply, filter, and damper compartments. Energy recovery wheels (smaller than 54 inches) shall be mounted in a slide-out track for ease of inspection, removal, and cleaning.

E. Fan Section

1. Centrifugal fans to be double width, double inlet, forward curved type. All blower wheels shall be statically and dynamically balanced. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds. Separate motors for exhaust and supply blowers shall be provided. Adjustable sheaves on belt-driven fans with motors less than 10 hp shall allow independent balancing of exhaust and supply airflows. Fan and motor assemblies are mounted to unit base with neoprene isolators as standard. Fans shall be located in draw-through position in reference to the energy recovery wheel.

F. Motors and Drives

1. Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase, and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts; 10 horsepower and less shall be supplied with an adjustable drive pulley. Energy wheel motors shall have integral overload protection.

G. Filters

1. Supply and exhaust air filters shall be 2-inch thick pleated fiberglass, 30% efficient and tested to meet UL Class 2. Filter racks shall be die-formed galvanized steel.

H. Electrical

1. All internal electrical components shall be factory wired for single point power connection. Units with electric reheat will be wired with independent power supply. All electrical components shall be UL Listed, Approved, or Classified where applicable and wired in compliance with the National Electrical Code.

2. Weatherproof, integral door interlocking disconnect switch, motor starters, control circuit fusing, control transformer for 24 VAC circuit, and terminal strip shall be supplied as standard components in the control center. Motor starters consist of a contactor and Class 20 electronic adjustable overload protection and shall be provided for all motors in the unit.

3. Units shall come with supply and exhaust fan VDFs for system balancing.

I. Cooling Coils

1. Direct expansion (DX) and chilled water coils shall be factory tested and rated according to ARI 410. Coils shall have copper tubes with permanently expanded aluminum fins, 12 fpi or less. DX coils shall be equipped with distributors to receive expansion valves at the liquid connections.

J. Warranty

1. The energy recovery ventilator shall be warranted to be free from defects in material and workmanship for a period of one year from the purchase date. The energy recovery wheel shall be warranted to be free from defects in material and workmanship for a period of five years from the purchase date. Motors shall be warranted by the motor manufacturer for a period of one year from the purchase date.

PART 3EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions, and as shown on the plans.

3.2 SCHEDULE

A. See schedule on plans.

END OF SECTION

Section 23 81 28 - Water to Air Heat Pumps

PART 1 GENERAL

1.1 **SECTION INCLUDES**

A. Water-source heat pumps.

1.2 RELATED REQUIREMENTS

A. REFERENCE STANDARDS

1. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.
2. ASHRAE Std 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2005.
3. ASHRAE Std 90.1 - Energy Efficient Design of New Buildings Except Low-Rise Residential
    a. Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2004.
4. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National
    a. Fire Protection Association; 2002.
5. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2006.
6. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2006.

B. SUBMITTALS

1. See Section 01 3000 - Administrative Requirements, for submittal procedures.
2. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
3. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
4. Design Data: Indicate refrigerant pipe sizing.
5. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions. F. Project Record Documents: Record actual locations of components and connections.
6. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
7. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

C. QUALITY ASSURANCE

1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum Five years of documented experience.

D. WARRANTY

1. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Provide a TEN year parts warranty for all equipment components

2. Provide a FIVE year labor warranty for all labor associated with warranty issues for equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Daikin Applied

B. Carrier Corporation: www.carrier.com. <http://www.carrier.com/>

C. Trane Inc: www.trane.com. <http://www.trane.com/>

D. Florida Heat Pump

E. Water Furnace

F. Substitutions: See Section 01 6000 - Product Requirements.

G. General - High efficiency horizontal and vertical unit

1. Equipment shall be completely assembled, piped, internally wired, fully charged with R410A and test operated at the factory. Filters, thermostat field interface terminal strip, and all safety controls are furnished and factory installed.

2. The system water inlet and outlet connections shall be female NPT composed of either copper or a bronze option.

3. The equipment shall contain ETL, CETL, and ARI-ISO 13256-1 listings and labels prior to leaving the factory. Service and caution area labels shall also be placed on the unit in their appropriate locations

H. Unit casing - Horizontal and vertical units

1. All panels shall be insulated with 1/2-inch thick dual density bonded glass fiber. The exposed side is a high density erosion proof material suitable for use in air streams up to 3600 feet per minute (FPM). The insulation meets the erosion requirements of UL 181. It has a flame spread

   a. of less than 25 and a smoke developed classification of less than 50 per ASTM E-84 and UL 723.

2. Access for inspection and cleaning of the unit drain pan, coils and fan section shall be provided.

   a. The unit shall be installed for proper access. Procedures for proper access inspection and cleaning of the unit shall be included in the maintenance manual.

I. Sound attenuation package

1. Sound attenuation will be applied as a standard feature in the product design. The sound reduction package (1/2 through 5-ton equipment) will include a compressor discharge muffler, vibration isolation to the compressor and water-to-refrigerant coil, unit base stiffeners, insulated metal compressor enclosure, and a second stage of vibration isolation to the compressor and water-to-refrigerant base pan.

2. The unit shall be tested and rated according to ARI 260.

J. Compressor - Horizontal or vertical units

1. The unit shall contain a high efficiency rotary, reciprocating, or scroll compressor. External vibration isolation shall be provided by rubber mounting devices located underneath the mounting base of the compressor. A second isolation of the refrigeration assembly shall be supported under the compressor mounting base. Internal thermal overload protection shall be provided. Protection against excessive discharge pressure shall be provided by means of a high pressure switch. Protection against a loss of charge shall be provided by a low pressure safety.

K. Water-to-refrigerant system - Copper heat exchanger - Unit size 072 - 300

1. Heat Exchanger - The water-to-refrigerant heat exchanger is of a high quality coaxial coil for maximum heat transfer. The copper coil is deeply fluted to enhance heat transfer and minimize fouling and scaling. The coil has a working pressure of 400 psig on the water side and 650 psig on the refrigerant side. The factory shall provide rubber isolation to the heat exchanging device to enhance sound attenuation.

2. Reversing Valve - The reversing valve is a pilot operating sliding piston type with replaceable encapsulated magnetic coil. This valve is energized in cooling.

3. Tubing - The refrigerant tubing shall be of 99% pure copper. This system shall be free from contaminants and conditions such as drilling fragments, dirt and oil. All refrigerant and water lines shall be insulated with elastomeric insulation that has a 3/8-inch thick wall in the air-side section of the unit.

L. Water-to-refrigerant system - Copper heat exchanger - Unit size 048-060

1. Heat Exchanger - The water-to-refrigerant heat exchanger is of a high quality coaxial coil for maximum heat transfer. The copper coil is deeply fluted to enhance heat transfer and minimize fouling and scaling. The coil has a working pressure of 660 psig on both the refrigerant and water side. The factory shall provide rubber isolation to the heat exchanging device to enhance sound attenuation.

2. Reversing Valve (Does not apply to cooling only units) - The reversing valve is a pilot operating sliding piston type with replaceable encapsulated magnetic coil. This valve is energized in cooling.

3. Tubing - The refrigerant tubing shall be of 99% pure copper. This system shall be free from contaminants and conditions such as drilling fragments, dirt and oil. All refrigerant and water lines shall be insulated with elastomeric insulation that has a 3/8-inch thick wall in the air-side section of the unit.

M. Water-to-refrigerant system - Copper heat exchanger - Unit size 006-042

1. Heat Exchanger - The water-to-refrigerant heat exchanger is of a high quality coaxial coil for maximum heat transfer. The copper coil is deeply fluted to enhance heat transfer and minimize fouling and scaling. The coil has a working pressure of 780 psig on both the refrigerant and water side. The factory shall provide rubber isolation to the heat exchanging device to enhance sound attenuation.

2. Reversing Valve (Does not apply to cooling only units) - The reversing valve is a pilot operating sliding piston type with replaceable encapsulated magnetic coil. This valve is energized in cooling.

3. Tubing - The refrigerant tubing shall be of 99% pure copper. This system shall be free from contaminants and conditions such as drilling fragments, dirt and oil. All refrigerant and water lines shall be insulated with elastomeric insulation that has a 3/8-inch thick wall in the air-side section of the unit.

N. Electrical

1. The unit control box shall contain all necessary devices to allow heating and cooling operation to occur from a remote wall thermostat. These devices shall be as follows:

2. -24 VAC energy limiting class II 50 VA (minimum) transformer

3. -24 VAC blower motor relay

4. -24 VAC compressor contactor for compressor control

5. -Field thermostat connections shall be provided for ease of hook-up to a terminal strip located in the unit's control box

6. -Lockout relay which controls cycling of the compressor shall be provided to protect the compressor during adverse operating conditions. The device may be reset by interrupting power to the 24 VAC control circuit. Reset may be done either at a remote thermostat or through a momentary main power interruption.

O. Thermostatic expansion valve

1. The equipment is provided with a bi-directional thermal expansion valve. This device allows operation of the equipment in the range of 25 to 120 degrees F entering fluid temperatures and

   a. 40 to 95 degrees F entering air temperatures. The equipment operates with one variable (entering water temperature, entering air temperature, cfm or gpm) at an extreme condition. All other variables must be within the nominal range of operation.

P. Drain pan

1. The condensate pan shall be constructed of corrosion resistant material and insulated to prevent sweating. The bottom of the drain pan shall be sloped on two planes which pitches the condensate to the drain connection, this positively sloped drain pan complies with ASHRAE 62 for IAQ conformity. When the unit is installed and trapped per the manufacturer's installation manual, and local city specifications, the drain pan shall be designed to leave puddles no more the 2-inches in diameter, no more than 1/8-inch deep, no longer than 3-minutes following step 3 of the following test.

2. 1. Temporarily plug the drain pan.

3. 2. Fill the drain pan with 1/2-inch of water or the maximum allowed by the drain pan depth, whichever is smaller.

4. 3. Remove the temporary plug.

Q. Indoor fan - Unit size 006 - 060

1. The blower shall have multiple blower motor/sheave combinations available. Options of the blower motor/fan packages shall be selected and wired from the factory to match performance criteria suggested in the performance section. The fan(s) shall be placed in a draw-through configuration. They shall be constructed of corrosion resistant galvanized material.

R. Hot gas reheat

1. Dehumidification shall be provided through a hot gas reheat option. The coil shall consist of 3/8 or 1/2-inch copper tubes mechanically expanded into evenly spaced aluminum fins. All coils shall be proof and leak tested. The proof test must be performed at 1.5 times the maximum

   a. operation pressure and the leak test performed at the maximum operating pressure.

S. 1" [25mm] throwaway filter

1. A 1" [25mm] throwaway fiberglass filter will be included. The filter has an average arrestance of 76 percent and dust holding capacity of 26 grams per square foot. The dust holding capacity should include a colorless and odorless adhesive which retains dirt particles within the filter media after they have contacted the fibers.

T. Return air flange - Vertical WSHP 1/2 through 5 ton

1. Return Air Flange is a side flange to allow connection of return air duct and is field installed. The return air flange does not allow for a fully sealed application.

PART 3 EXECUTION

3.1 **3.01 EXAMINATION**

A. Verify that substrates are ready for installation of units and openings as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install according to manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install according to NFPA 90A and NFPA 90B.

C. Provide vent connections according to NFPA 211.

D. Install refrigeration systems according to ASHRAE Std 15.

3.3 **SCHEDULE**

A. See Schedule on Plans

END OF SECTION

Section 23 81 49 - Ground-Source Unitary Heat Pumps

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water-source water-to-water heat pump for installation in conjunction with hydronic HVAC system.

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets for each product furnished, including:

1. Electrical and performance data showing compliance with specifications.
2. Required water flow rates and temperatures for inflow and outflow.
3. Detailed electrical wiring diagrams.
4. Storage and handling requirements and recommendations.
5. Installation instructions.
6. Start-up, troubleshooting, and TAB instructions.
7. Specimen warranty.

C. Shop Drawings: Show piping connections and interface to source-side and load-side piping, circulator pumps, and condensate drains. Include control wiring diagrams prepared specifically for this project, showing interface to space temperature control systems.

D. Field Test Reports.

E. Operation and Maintenance Data: Include replaceable parts lists, parts sources, and troubleshooting guide.

F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of the type this section and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Verify upon delivery that equipment nameplate data, including electrical data, matches specified and ordered equipment. Verify that refrigerant charge has been retained during shipping.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store products under cover and elevated above grade.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Ground-Source Unitary Heat Pumps:

1. Carrier Corporation: www.carrier.com.
2. Daikin Applied: www.daikinapplied.com.
3. Trane Inc: www.trane.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 HEAT PUMPS

A. Heat Pumps: Factory-assembled water-source water-to-water heat pump; unit comprised of but not limited to the following components: compressor, reversing valve, refrigerant thermal expansion valve, refrigerant-to-water condensing coil, refrigerant-to-water evaporator coil, motors, hoses, controls, and internal wiring.

1. Water Source: Ground-coupled heat exchanger specified in Section 23 21 13.33.
2. Leaving Water Temperature Range: Provide units capable of producing water temperature up to 130 degrees F and down to 25 degrees F.
3. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
4. Equipment using refrigerants R-11, R-12, R-113, R-114, R-115, R-500, or refrigerants with ozone depletion factor (ODF) greater than 0.05 will not be permitted.
5. Certification: Provide units listed by ETL, UL, or CSA.
6. Labels: Prominently located permanent label showing equipment characteristics; include instructional and warning labels inside cabinet or cabinet covers.

B. Cabinet: Manufacturer's standard galvanized steel cabinet finished with appliance-grade corrosion resistant epoxy, acrylic lacquer, or electrostatic powder coating, with removable cover or access panels for inspection and access to internal parts.

1. Cabinet Insulation: Minimum 1/2 inch 1-1/2 pcf density fiberglass insulation.
2. Pipe Connections: Copper or stainless steel female threaded pipe connections mechanically fastened to the cabinet.
3. Low Temperature Pipe, Tubing, and Heat Exchangers: Insulated with elastomeric insulation having flame spread index less than 25 and smoke developed index of less than 50, when tested according to ASTM E84; and UL 94 rated.

C. Compressor: Hermetically sealed scroll type compressor with internal vibration isolation, installed on vibration isolators inside cabinet.

D. Refrigeration Circuits: Copper refrigerant piping, liquid line service valve, suction line service valve, full charge of compressor oil, holding charge of refrigerant; thermostatic expansion valves for refrigerant metering, and solenoid activated refrigerant reversing valves energized only during the cooling mode and designed to fail in the heating position.

E. Refrigerant-to-Water Heat Exchangers: Coaxial (tube-within-a-tube) or brazed plate type, tested and rated for 450 psi refrigerant working pressure.

1. Coaxial Heat Exchangers: Inner copper water tube and outer steel refrigerant tube.

2. Brazed Plate Heat Exchangers: Stainless steel, with bi-directional liquid line filter drier.

F. Control Components: 24 V AC electromechanical controls, factory wired and mounted in control box in cabinet; provide controllers and contactors for maximum of 120-volt control circuits and auxiliary contacts for use with controls furnished.

1. Microprocessor Controller: Control sequencing, emergency shutdown, LED mode and fault indicators, fault memory, input and output diagnostics, and a communications port for remote direct digital control (DDC).

2. Start capacitor.

3. Motor thermal overload protection.

4. High and low voltage protection.

5. Factory-installed low voltage transformer.

6. Low voltage terminal block, with open contacts for field control wiring.

G. Control Functions: Provide operational sequencing controls and compressor lockout relay with capability to reset at the remote thermostat and at the disconnect.

1. Lockout Relay: Triggered by the following:

a. High and low refrigerant pressure compressor shut-offs.

b. Freezestat: Low water temperature compressor shut-off, set at 35 degrees F.

2. Provide source loop pump start/stop coordination.

3. Random start relay.

4. Night setback relay.

5. Anti-short cycle timer.

H. Vibration Isolation Pad: Mineral fiber pad between equipment and substrate.

2.3 PIPING SPECIALTIES

A. Flexible Pipe Connections: Braided stainless steel hoses with swivel connectors; UL 94 rated.

1. Minimum Working Pressure: 300 psi.

2. Length: 2 feet, minimum.

B. Piping Specialties: Provide the following:

1. Flow control valve with test ports.

2. Two shutoff ball valves with memory stops (one with test port).

3. Y-strainer.

C. Auxiliary Drain Pans, Drain Connections, and Drain Lines: Provide galvanized steel auxiliary drain pans under units where indicated.

1. Provide separate drain lines for the unit drain and auxiliary drain pans.

2. Trap drain pans from the bottom to ensure complete pan drainage.

3. Provide drain lines full size of drain opening.

4. Comply with Section 22 10 05.

2.4 CONTROLS

A. See Specification Section 23 0993 - Sequence of Operations for HVAC Controls

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that power supply complies with equipment specifications.

B. Verify that all connections for water and electricity are available, operational, and placed correctly for unit installation.

C. Verify that equipment is undamaged, including refrigerant components and valves and electrical connections.

D. Verify that substrates are sound and ready for installation.

E. Do not begin installation until installation sites have been properly prepared. If installation site preparation, such as the water source, 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.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

3.3 INSTALLATION

A. PIPING SYSTEM FLUSHING PROCEDURE

1. Prior to connecting the heat pump to the condenser and chilled water loop, the piping loops shall be flushed with a detergent and hot water (110-130° F) mixture to remove previously accumulated dirt and other organic . In old piping systems with heavy encrustation of inorganic materials consult a water treatment specialist for proper passivation and/or removal of these contaminants.

B. Water Treatment Requirements

1. Supply water for both the chilled water and condenser water circuits shall be analyzed and treated by a professional water treatment specialist who is familiar with the operating conditions and materials of construction specified for the heat pump's heat exchangers, headers and associated piping. Cycles of concentration shall be controlled such that recirculated water quality for modular heat pumps using 316 stainless steel brazed plate heat exchangers and carbon steel headers is maintained within the following parameters:

a. pH Greater than 7 and less than 9

b. Total Dissolved Solids (TDS) Less than 1000 ppm

c. Hardness as $CaCO_3$ 30 to 500 ppm

d. Alkalinity as Ca CO_3 30 to 500 ppm

e. Chlorides Less than 200 ppm

f. Sulfates Less than 200 ppm

C. Install equipment according to the manufacturer's written installation instructions.

D. Do not obstruct maintenance access to equipment by any type of piping, electrical conduit, or any other utility.

E. Flush and clean piping before placing in operation; take precautions to prevent introduction of debris into piping systems.

F. Connections to Existing Systems: Obtain approval before interrupting service; notify the Architect in writing at least 15 calendar days prior to the date the connections are required.

G. Start system and adjust controls and equipment so as to give satisfactory operation.

H. Adjust water temperature control system and place in operation so that water quantities circulated are as required.

3.4 FIELD QUALITY CONTROL

A. Upon completion and before final acceptance of work, test each system to demonstrate compliance with the contract requirements.

1. Adjust controls and balance systems prior to final acceptance of completed systems.

2. Test controls through every cycle of operation.

3. Test safety controls to demonstrate performance of required function.

4. Furnish water, electricity, instruments, connecting devices, and personnel for tests.

5. Clean equipment, piping, strainers, ducts, and filters.

6. Coordinate testing with testing of related piping, specified elsewhere.

7. Correct defects in work and repeat tests.

B. Operational Testing: After demonstration of satisfactory operation perform operational testing:

1. Test each item of equipment in operation for continuous period of not less than 24 hours under every condition of operation according to equipment manufacturer's recommendations.

2. Verify that each item of equipment operating parameters are within limits recommended by the manufacturer.

3. Manufacturer's Recommended Test: Conduct the manufacturer's recommended field testing; furnish a factory trained field representative authorized by and to represent the equipment manufacturer during the complete execution of the field testing.

C. Additional requirements for testing, adjusting, and balancing (TAB) of piping, equipment, and controls are specified in Section 23 05 93.

D. Within 30 calendar days after acceptable completion of testing, submit each test report for review and approval; include:

1. Unit nameplate data, and actual voltage and ampere consumption.

2. Load-side supply and return water flow and temperatures, and measurement equipment.

3. Source-side supply and return water flow and temperatures, and measurement equipment.

4. Ambient air temperature at heat pump unit.

5. Date and name and signature of person testing and reporting.

3.5 CLOSEOUT ACTIVITIES

A. Training: Upon completion of work and at time designated by Architect, provide services of water source heat pump manufacturer's technical representative for period of not less than one 8-hour working day for instruction of Owner operating personnel in proper operation and maintenance of equipment.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

Section 23 82 00 - Convection Heating and Cooling Units

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electric unit heaters.

1.2 RELATED REQUIREMENTS

A. Section 23 09 93 - Sequence of Operations for HVAC Controls.

1.3 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:

1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.

2. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

3. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 ELECTRIC UNIT HEATERS

A. Manufacturers:

1. INDEECO (Industrial Engineering and Equipment Company)
: www.indeeco.com/#sle.

2. Modine Manufacturing Company: www.modineHVAC.com/#sle.

3. Stelpro Design Inc; ARUH - Oxford Commercial Industrial Unit Heater: www.stelpro.com/#sle.

4. Trane Technologies, PLC: www.trane.com/#sle.

5. REZNOR.

6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Heating Element Assembly:

1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.

2. Horizontal Projection Units:

a. Steel fins copper brazed to steel sheath and epoxy sealed for moisture resistance.

b. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.

c. High-mass, all steel tubular type, copper brazed, centrally located and installed in fixed element banks.

D. Housing:

1. Horizontal Projection Units:

a. Construction materials to consist of heavy gauge steel with galvanized, polyester powder coat, or high gloss baked enamel finish.

b. Provide with threaded holes for threaded rod suspension.

c. Provisions for access to internal components for maintenance, adjustments, and repair.

d. Watertight construction for high moisture, corrosive prone washdown spaces.

E. Air Inlets and Outlets:

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are suitable for installation.

3.2 INSTALLATION

A. Install according to manufacturer's recommendations.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Do not damage equipment or finishes.

D. Unit Heaters:

1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.

2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

3.4 CLEANING

A. After construction and painting is completed, clean exposed surfaces of units.

B. Vacuum clean coils and inside of units.

3.5 PROTECTION

A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION

Section 23 83 16 - Radiant Floor Heating

PART 1 GENERAL

1.1 SUMMARY

A. Thermal hydronic radiant heating

B. The work in this section includes, but is not limited to, the following:

1. Complete radiant heating and/or cooling system as shown in the drawings and as specified
2. Coordination with the selection and installation of circulation pumps and distribution piping
3. System controls and automation
4. Manufacturer-supported system startup and commissioning service

1.2 QUALITY ASSURANCE

A. References

1. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are cited by issuing authority abbreviation and standard designation.
2. ASTM International
   a. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
   b. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials
   c. ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
   d. ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing
   e. ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems
   f. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing
3. American National Standards Institute (ANSI)/Underwriters Laboratories, Inc. (UL)
   a. ANSI/UL 263 Standard for Safety for Fire Tests of Building Construction and Materials
4. Canadian Standards Association (CSA)
   a. CAN/CSA B137.5 Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications
5. German Institute for Standards (Deutsches Institut fur Normung e.V., DIN)
   a. DIN 4726 Pipelines of Plastic Materials Used in Warm Water Floor Heating Systems; General Requirements

6. International Conference of Building Officials (ICBO) Evaluation Services
    a. Evaluation Report No. 4407
    b. Evaluation Report No. 5143
7. International Code Council (ICC)
    a. International Mechanical Code (IMC)
    b. ICC Evaluation Service (ES) Evaluation Report No. ESR 1099
8. Plastics Pipe Institute (PPI)
    a. Technical Report TR-3 Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials
    b. Technical Report TR-4 Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Piping and Fitting Compounds
9. International Association of Plumbing and Mechanical Officials (IAPMO)
    a. Uniform Mechanical Code
10. Uponor, Inc.
    a. Complete Design Assistance Manual (CDAM), current edition
    b. Radiant Floor Installation Handbook, current edition
    c. Advanced Design Suite™ (ADS) software

B. SYSTEM DESCRIPTION

1. Design Requirements
    a. Standard Grade hydrostatic pressure ratings from Plastics Pipe Institute according to TR-3 as listed in TR-4. The following three standard grade ratings are required.
        (1) 200 degrees F (93 degrees C) at 80 psi (551 kPa)
        (2) 180 degrees F (82 degrees C) at 100 psi (689 kPa)
        (3) 73.4 degrees F (23 degrees C) at 160 psi (1102 kPa)
    b. Certification of flame spread/smoke development rating of 25/50 according to ASTM E84 for the following PEX tubing sizes when installed un-insulated at a tube spacing not less than 18 inches (457.2mm) apart.
        (1) 5/8 inch [15.88mm]
        (2) ¾ inch [19.05mm]
    c. Certification of flame spread/smoke development rating of 25/50 according to ASTM E84 for the following PEX tubing sizes when encased with ½ inch fiberglass insulation at tube spacing of not less than 4 inches (101.6mm) apart.
        (1) 5/8 inch [15.88mm]
        (2) ¾ inch [19.05mm]
        (3) 1 inch [25.4mm]
        (4) 1 ¼ inch [31.75mm]
        (5) 1 ½ inch [38.1mm]
        (6) 2 inch [50.8mm]

2. Performance Requirements: Provide hydronic radiant heating and/or cooling system that is manufactured, fabricated and installed to comply with regulatory agencies and authorities with jurisdiction, and maintain performance criteria stated by the PEX tubing manufacturer without defects, damage or failure.

   a. Show compliance with ASTM F877.

   b. Show compliance with DIN 4726 regarding oxygen diffusion concerns.

   c. Show compliance with ASTM E119 and ANSI/UL 263 through certification listings through Underwriters Laboratories, Inc. (UL).

      (1) UL Design No. L557 - 1 hour wood frame floor/ceiling assemblies

      (2) UL Design No. K913 - 2 hour concrete floor/ceiling assemblies

      (3) UL Design No. U372 - 1 hour wood stud/gypsum wallboard wall assemblies

      (4) UL Design No. V444 - 1 hour steel stud/gypsum wallboard wall assemblies

3. Hydronic radiant system manufacturer shall have successfully completed five installations of similar type and scope. Manufacturer shall provide from the factory a full-time representative to supervise the complete design, detailing, coordination, installation and commissioning of the hydronic radiant system.

4. The contractor shall furnish all labor, materials, tools, equipment, appliances and services necessary to deliver and install all hydronic radiant dimensions to the hydronic radiant manufacturer.

1.3 SUBMITTALS

A. General: Submit listed submittals according to Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product submittal data and installation instructions.

C. Submit the following shop drawings, calculations and reports.

1. Submit shop drawings for piping installation in the project. Indicate all valves, pumps and items of equipment that are required to control and operate the hydronic radiant system for heating and/or cooling as shown on the drawings and described in the sequence of operations. Submit a valve and pump schedule listing each number, type, size, model and service. Cross reference to supporting product data.

2. Submit manufacturer's detailed drawings showing layouts, fixing details and piping details of all areas where hydronic radiant systems are indicated along with product and performance data for each component.

3. Provide calculations that support the heating and/or cooling performance requirements of the hydronic radiant system. These calculations should show the flow through the system for heating and/or cooling as well as the primary heating and/or cooling connections to the radiant system headers and control circuits. Provide system pressure-drop calculations as well.

4. Submit drawings showing details of manifolds, including all connections and valves. If manifolds are to be installed on a wall, then the details should include all fixture details. If the manifolds are to be installed in wall cavities, then provide all fixture and access details.

5. Specify piping materials and temperature/pressure ratings.

6. Provide drawings showing the location of all expansion and penetration sleeves, showing coordination with concrete slab expansion joints. Provide confirmation of concrete slab expansion requirements and the use of any concrete additives.

7. Provide drawings showing piping manifold locations and installation details.

8. Provide control sequences and requirements for control hardware devices. Indicate compliance and coordination with requirements of other specification sections.

9. Provide piping sample with certification of properties.

10. Submit manufacturer's report detailing that the hydronic radiant system has been installed according to this specification and the manufacturer's specified instructions.

11. Submit report indicating that installation was performed according to the manufacturer's instructions. Include pressure testing documentation as required in related specification sections.

12. Submit start-up report demonstrating that system meets required capacity, is fully functional and commissioned to the satisfaction of system manufacturer.

13. Provide installation drawings indicating tubing layout, manifold locations, zoning requirements and manifold schedules with details required for installation of the system. Provide sectional drawing of floor slab demonstrating coordination with other construction trades and showing insulation, if required.

14. Quality Assurance/Control Submittals: Submit test reports. Upon request, submit test reports from recognized testing laboratories.

15. Documentation: Submit the following documentation:

    a. Manufacturer's certificate indicating products comply with specified requirements.

    b. Manufacturer's detailed room-by-room heat-loss or gain analysis for the structure.

    c. Documentation indicating the installer is trained to install the manufacturer's products.

16. Close-out Submittals: Submit the following documents.

    a. Warranty documents specified herein

    b. Operation and maintenance data

    c. Manufacturer's field reports specified herein

    d. Final as-built tubing layout drawing

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving successful completion of hydronic radiant system installation training by the PEX tubing manufacturer.

B. Regulatory Requirements and Approvals: Provide a hydronic radiant heating and/or cooling system that complies with the following requirements.

1. International Code Council (ICC)

    a. International Mechanical Code (IMC)

    b. International Building Code (IBC)

    c. ICC Evaluation Service (ES) Evaluation Report No. ESR 1099

    d. International Association of Plumbing and Mechanical Officials (IAPMO)

        (1) Uniform Mechanical Code (UMC)

2. Certifications: Provide letters of certification as follows.

    a. Installer is trained by the PEX tubing manufacturer to install hydronic radiant systems.

b. Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed tradesperson.

3. Pre-installation Meetings

a. Verify project requirements, substrate conditions, floor coverings, manufacturer's installation instructions and warranty requirements.

b. Review project construction timeline to ensure compliance or discuss modifications as required.

c. Interface with other trade representatives to verify areas of responsibility.

d. Establish the frequency and construction phrase the engineer intends for site visits and inspections by the PEX tubing manufacturer's representative.

1.5 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Section.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1. Store PEX tubing in cartons or under cover to avoid dirt or foreign material from entering the tubing.

2. Do not expose PEX tubing to direct sunlight for more than 30 days. If construction delays are encountered, cover the tubing to prevent exposure to direct sunlight.

1.6 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

1. Warranty may transfer to subsequent owners.

a. Warranty Period for PEX Tubing: 30-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion when installed by a factory-trained Uponor Home Comfort Team (HCT) contractor

b. Warranty Period for Manifolds and Fittings: 5-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion when installed by a factory-trained Uponor HCT contractor

c. Warranty Period for Controls and Electrical Components: 2-year, non-prorated warranty against failure due to defect in material or workmanship, beginning with date of substantial completion when installed by a factory-trained Uponor HCT contractor

d. If a factory-trained Uponor HCT contractor does not install the system, then the most recent limited warranty published by the PEX tubing manufacturer takes precedence.

PART 2 PRODUCTS

2.1 HYDRONIC RADIANT HEATING AND SNOW MELT SYSTEM

A. Manufacturer: Uponor, Inc.

1. Uponor, Inc.

2. Rehau

2.2 PRODUCT SUBSTITUTIONS

A. All products, components, etc., specified herein are manufactured by and/or available from the PEX tubing manufacturer.

B. Alternative equipment manufacturers must submit required data for all electrical, mechanical, structural, engineering, etc. revisions for an equivalent system for approval 15 days prior to bid.

C. Alternative equipment manufacturers must submit completed hydronic radiant system design layout to the engineer for approval. Plagiarism of another manufacturer's design is unacceptable.

2.3 HYDRONIC RADIANT HEATING AND SNOW MELT EQUIPMENT

A. Tubing

1. Material: Crosslinked polyethylene (PEX) manufactured by PEX-a, or Engel, method

2. Material Standard: Manufactured according to ASTM F876 and ASTM F877 and tested for compliance by an independent third-party agency

3. Pressure Ratings: Standard Grade hydrostatic design and pressure ratings as issued by the Plastics Pipe Institute (PPI), a division of the Society of the Plastics Industry (SPI)

4. Show compliance with ASTM E119 and ANSI/UL 263 through certification listings through UL.

a. UL Design No. L557 - 1 hour wood frame floor/ceiling assemblies

b. UL Design No. K913 - 2 hour concrete floor/ceiling assemblies

c. UL Design No. U372 - 1 hour wood stud/gypsum wallboard wall assemblies

d. UL Design No. V444 - 1 hour steel stud/gypsum wallboard wall assemblies

5. Minimum Bend Radius (Cold Bending): No less than six times the outside diameter. Use the PEX tubing manufacturer's bend supports if radius is less than stated.

6. Barrier Tubing Type: Wirsbo hePEX™ or equal

a. Tubing shall have an oxygen-diffusion barrier that does not exceed an oxygen diffusion rate of 0.10 grams per cubic meter per day at 104 degrees F (40 degrees C) water temperature according to German DIN 4726.

b. Nominal Inside Diameter: Provide tubing with nominal inside diameter according to ASTM F876, as indicated in the system design.

7. Non-barrier Tubing Type: Uponor AquaPEX® or equal

a. Tubing does not feature an oxygen-diffusion barrier.

b. Nominal Inside Diameter: Provide tubing with nominal inside diameter according to ASTM F876, as indicated in the system design.

8. An oxygen-diffusion barrier tubing is not required if one of the following design strategies is used.
    a. Isolate the ferrous materials in the boiler and other components within the primary side of the mechanical system with a heat exchanger.
        (1) Use non-ferrous components within the secondary system side (e.g., pumps, expansion tanks, etc.).
    b. Use non-ferrous components within the entire fluid pathway.

B. Brass Manifolds
1. For system compatibility, use 1¼-inch brass manifolds offered by the PEX tubing manufacturer.
2. Use manifolds constructed of dezincification-resistant brass.
3. Use appropriately sized manifolds boxes to allow the manifold assemblies to be mounted inside the wall cavity.
4. Use manifold mounting brackets offered by the PEX tubing manufacturer.
5. Manifolds must be capable of individual flow control for each loop on the manifold through valve actuators available from the manifold supplier.
6. Manifolds must feature manual flow balancing capability within the manifold body for balancing unequal loop lengths across the manifold.
7. Install flow setter on the return leg from the manifold to provide flow balancing between manifolds.
8. Manifolds support 5/16 inch through 3/4" inch PEX tubing.
9. Each manifold location should have the ability to vent air manually from the system.

C. Fittings
1. For system compatibility, use fittings offered by the PEX tubing manufacturer.
2. The fitting assembly must comply with ASTM F877 and CAN/CSA B137.5 requirements.
3. Uponor QS20 Compression Fittings or equivalent
    a. Fitting assembly manufactured from UNS C3600 series brass material
    b. The fitting assembly consists of a barbed insert, a compression ring and a compression nut. The barbed insert is manufactured with an o-ring to facilitate air pressure testing.
4. Uponor ProPEX® Fittings or equivalent
    a. Fittings manufactured according to ASTM F1960
    b. Fitting assembly manufactured from material listed in paragraph 5.1 of ASTM F1960
    c. The fitting assembly consists of a barbed adapter and an appropriately sized PEX ring. The barbed insert may include an o-ring to facilitate pressure testing with air.

D. Supply-and-return Piping to the Manifolds (above-ground piping)
1. Properly size supply-and-return distribution piping for the given volume and velocities required at system design
2. Use suitable distribution piping material (i.e., Wirsbo hePEX, type M copper or black iron piping) for all supply fluid temperatures in systems with ferrous components.

3. Use suitable distribution piping material (i.e., Uponor AquaPEX tubing or HDPE) for systems free of or isolated from ferrous components.

    a. When using HDPE mains, do not exceed 140 degrees F (60 degrees C) at 80 psi (551 kPa).

    b. When using Uponor AquaPEX mains, do not exceed 200 degrees F (93 degrees C) at 80 psi (551 kPa).

4. Do not expose PEX tubing to direct sunlight or install near overhead fluorescent lighting. If PEX tubing is exposed, install suitable pipe insulation around the exposed tubing.

5. Use fittings compatible with piping material. Fittings must transition from distribution piping to system manifolds.

E. Supply-and-Return Piping to the Manifolds (below ground piping)

1. Use properly size supply-and-return distribution piping for the given volume and velocities required at system design.

2. Use suitable distribution piping material (i.e., Wirsbo hePEX tubing, type K copper or black iron) for all supply fluid temperatures in systems with ferrous components.

3. Use suitable distribution piping material (i.e., Uponor AquaPEX tubing or HDPE) for systems free of or isolated from ferrous components.

    a. When using HDPE mains, do not exceed 140 degrees F (60 degrees C) at 80 psi (551 kPa).

    b. When using Uponor AquaPEX mains, do not exceed 200 degrees F (93 degrees C) at 80 psi (551 kPa).

4. If copper or black iron piping is embedded in concrete or soil, insulate or protect with sleeves.

5. Use fittings compatible with piping material. Fittings must transition from distribution piping to system manifolds.

F. All equipment used shall be furnished by one hydronic radiant system manufacturer and be fully compatible to work as an integrated system.

G. Provide flow-balancing manifolds to be assembled with manual air vent, drain and refill valves, supply module with built in shut-off valve, return module with manual flow regulating-and-balancing valve.

H. General Contractor to provide high-density rigid board insulation for both base concrete structural slab and topping slab edge insulation where not provided by others. Minimum

I. two-inch thickness to be confirmed during shop-drawing coordination. Insulation to be selected for compressive strength appropriate for this installation.

J. General Contractor to provide control/monitoring devices, hardware equipment and software necessary to provide a complete operating hydronic radiant system, independent of existing base-building control system. Coordinate with requirements included in related specification sections.

2.4 ACCESSORIES

A. Use accessories associated with the installation of the hydronic radiant heating and/or cooling system as recommended by or available from the PEX tubing manufacturer.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including the following.

1. Uponor Complete Design Assistance Manual (CDAM), current edition
2. Uponor Radiant Floor Installation Handbook, current edition

3.2 EXAMINATION

A. Site Verification of Conditions

1. Verify that site conditions are acceptable for installation of the hydronic radiant heating and/or cooling system.
2. Do not proceed with installation of the hydronic radiant heating and/or cooling system until unacceptable conditions are corrected.

3.3 INSTALLATION

A. Slab On-grade Installation

1. Fasten the tubing to the flat mesh or reinforcing bar according to the PEX tubing manufacturer's installation recommendations.
2. Use closer tubing on-center distances along exterior walls. Increase tubing on-center distances as the installation moves away from the exterior wall(s).
    a. Use 6 inches (152mm) on center for exterior section of the design.
    b. Do not exceed 9 inches (229mm) on center for interior sections of the design.
    c. Do not install tubing within 6 inches (152mm) of any wall.
    d. Refer to the submitted radiant floor design layout for actual on-center information.
3. If the design requires under-slab insulation, the structural engineer determines the vertical compressive strength of the high-density extruded board insulation. The radiant floor design determines the required insulation resistance value (R-value).
4. When using high-density board insulation, staple the tubing to the insulation board with Uponor Foam Staples.
5. Use edge insulation when the heated system directly contacts an exterior wall or beam.
6. Install tubing at a consistent depth below the surface elevation as determined by the engineer. Ensure sufficient clearance to avoid control joint cuts.
7. In areas where tubing must cross metal expansion joints in the concrete, ensure the tubing passes below the joints. Depending on the manufacturer's and structural engineer's recommendation, fibrous expansion joints may tolerate penetration.
8. For tubing that exits the slab in a 90-degree bend, use metal or PVC bend supports.

B. Length of loops and piping location and spacing to be determined by the manufacturer and approved by the Owner's Representative.

C. Verify high-density rigid board insulation and vapor barrier has been installed.

D. Insure that a minimum bending radius of 6 times piping diameter or per manufacturer's recommendations (if more stringent) is obtained.

E. Piping to have a fully enclosed protective conduit where tubing first penetrates concrete flooring.

F. Provide a 12-inch (300mm) long protective sleeve where pipe crosses expansion joints.

G. Insure a minimum of a ¼-inch (6mm) thick foam or "sill gasket" expansion strip is placed against all inner and outer walls (i.e., where the topping comes in contact with a wall plate).

H. All piping to be identified with loop numbers marked on pipe wall before connecting to manifold using a permanent tag.

1. Verify actual loop length for each loop on a manifold.

2. Room identification plus loop number is to be printed and placed on each individual module in the manifold tag slot with the identification tags provided.

3. All loops must be identified to allow for future balancing.

I. Coordinate slab tubing layout with other devices (electrical conduits and boxes, telecommunication conduits and boxes, plumbing penetrations, construction and furniture supports) and all other services within or attaching to the slab. Zones designated on the drawings shall be kept clear of all radiant floor tubing.

J. M. Provide survey documentation of tubing layout on a 10-foot grid after installation of tubing and prior to pouring concrete. Notify Owner's Representative three days in advance of concrete pour to allow inspection of installation and survey documentation.

K. Glycol and Water Solution

1. The PEX tubing manufacturer recommends premixed glycol and water solutions.

a. PEX tubing manufacturer allows site-mixed solutions if mixed to the proper concentration before entering the system.

b. Mix the glycol and water solution to proper concentration levels to protect the system from freezing during operation shutdown.

c. System circulators must operate continuously for a minimum of 30 days after the system is filled to ensure the glycol and water does not separate in a static system.

2. Do not use ethylene glycol due to toxicity issues. The PEX tubing manufacturer recommends the use of inhibited propylene glycol for hydronic radiant heating and/or cooling systems. Refer to the boiler manufacturer's recommendations.

L. Through-penetration Firestops

1. Ensure compatibility of one- and two-hour rated through-penetration assemblies according to ASTM E814.

2. Refer to the PEX tubing manufacturer for manufacturers that list PEX tubing with their firestop systems.

3.4 FIELD QUALITY CONTROL

A. Site Tests

1. To ensure system integrity, pressure test the system before covering tubing in concrete or when other trades are working in the vicinity of the tubing.

2. Test all electrical controls according to respective installation manuals.

3.5 ADJUSTING

A. Balancing Across the Manifold

1. Balance all loops across each manifold for equal flow resistance based on actual loop lengths and total manifold flow.

2. Balancing is unnecessary when all loop lengths across the manifold are within 3% of each other in length. Install the supply-and-return piping to the manifold in a reverse-return configuration to ensure self-balancing.

B. Balancing between manifolds is accomplished with a flow-control device installed on the return piping leg from each manifold.

3.6 CLEANING

A. Remove temporary coverings and protection of adjacent work areas.

B. Repair or replace damaged installed products.

C. Clean installed products according to manufacturer's instructions prior to Owner's acceptance.

D. Remove construction debris from project site and legally dispose of debris.

3.7 DEMONSTRATION

A. Demonstrate operation of hydronic radiant heating and/or cooling system to Owner's personnel.

B. Advise the Owner's Representative about the type and concentration of glycol and water solution if used in the hydronic radiant heating and/or cooling system.

1. The Owner monitors the solution effectiveness through an established maintenance program as outlined by the glycol manufacturer.

3.8 PROTECTION

A. Protect installed work from damage caused by subsequent construction activity on the site.

END OF SECTION

43. Rest Area Building Electrical, Item SPV.0060.14; Maintenance Building Electrical, Item SPV.0060.18.

A Description

This item consists of the electrical construction work for the Rest Area Building and Maintenance Building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Rest Area Building Electrical and Maintenance Building Electrical as each individual installation, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.14	Rest Area Building Electrical	EACH
SPV.0060.18	Maintenance Building Electrical	EACH

Payment is full compensation for furnishing all materials and equipment, and for supplying all labor, tools, equipment, and incidentals necessary to complete the work. The contractor can receive prorated payments for this item by submitting a detailed estimate outlining the work completed and the costs associated to the engineer for approval.

Section 26 00 10 - Basic Electrical Requirements

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Basic Electrical Requirements specifically applicable to Division 26 Sections, in addition to Division 01 - General Requirements.

1.2 SCOPE OF WORK:

A. The Electrical Contract Installation shall include a complete Electrical Installation for the project. All conduit, fixtures and equipment herein specified, mentioned or shown on Drawings, shall be furnished and installed in place, connected up and ready for normal operation except for such items as are specifically mentioned to be furnished by others.

1.3 WORK INCLUDED:

A. The Electrical Contract shall include all work under the listed Sections of the Specifications Index and all related Electrical work as shown on the Drawings for the project.

B. A Complete table of Electrical Reference Symbols is shown on the plans.

C. Under this Contract the Electrical Contractor shall furnish the Owner with a USB flash drive and PDF set of all pertinent systems related documents. The documents shall contain the following items:

1. Shop drawings on all major equipment.
2. Operating Instructions for all major equipment.
3. Maintenance Instructions for all major equipment.
4. Wiring diagrams for all equipment.
5. Control drawings for any systems not furnished under other contracts.

D. The Electrical Contractor is responsible for own equipment, such as cranes, lifts, etc. in order to provide a complete installation of Electrical systems.

E. The Electrical Contractor is responsible for contacting the utility company and coordinating the power connection for the building service. Include all costs in bid.

F. Coordinate utility service outages and reconnections with Utility Company and Owner.

G. Branch feeders, branch wiring, receptacles, special outlets, switches, light fixtures, dimmers, contactors, starters, timers, etc., as shown on the plans or required for operation of the electrical system.

H. A telephone service conduit, where shown on the plans and a plywood mounting board in the equipment room painted white.

I. Repair of all damage done to the premises as a result of the installation and removal of all debris or surplus material left by those engaged in the work.

J. All new outside building lighting and sign lighting, including wiring, timers, photocells, switches and circuit breakers.

1.4 **SPECIFICATIONS COMPLIANCE**

A. The requirements of these specifications shall be complied with in every respect. Therefore, it shall be absolutely mandatory that the job foreman, all lead electricians, subcontractors and their foreman have completely studied these specifications, be completely knowledgeable as to their entire contents, and maintain a copy at the job-site. Failure to comply with this requirement will be reason to presume the electrician or subcontractor is not in responsible charge of their work due to ignorance of job requirements, and will be reason for the Owner to require dismissal and replacement with

approved personnel. Every foreman and lead mechanic shall be provided with a complete copy of this specification.

1.5 **INCONSISTENCIES**

A. If there is an inconsistency in the quality and/or quantity of Work required by the Contract Documents, either the greater quality and/or quantity of Work indicated shall be provided according to the Engineer/Architect's interpretation without change in the contract sum.

1.6 CODES, FEES AND LATERAL COSTS:

A. The Electrical Installation shall meet all applicable local, state and federal codes and standards. All permits necessary for a complete electrical installation shall be paid for by this Contractor.

B. Except in those municipalities which provide state-approved electrical inspection, all installation of electrical equipment wiring shall be inspected by the State Board of Electricity. Allowance shall be made in the bid and contract for the cost of such inspection.

C. Fees for such inspection will be charged according to the rules and regulations of the State Board of Electricity. Evidence of payment of fees shall be provided by the Contractor with the Request for Payment.

1.7 REGULATORY REQUIREMENTS:

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed by Underwriters Laboratories, Inc. or other testing firm acceptable to authority having jurisdiction.

1.8 SUBMITTALS:

A. Submit under provisions of Division 01.

B. Submit shop drawings and product data of related systems, products, and accessories.

C. Mark dimensions and values in units to match those specified.

1.9 PROJECT/SITE CONDITIONS:

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

1.10 SEQUENCING AND SCHEDULING:

A. Construct Work in sequence under provisions of Division 1.

1.11 PRE-CONSTRUCTION COORDINATION AND VERIFICATION:

A. This Contractor shall coordinate their work with other Contractors on this job. Any conflict which cannot be resolved shall be settled by the Architect/Engineer.

B. Field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions.

C. The Contractors shall check architectural, structural, plumbing, heating, ventilating and electrical plans to avert possible installation conflicts. Should drastic changes from original plans be necessary to resolve such conflicts this Contractor shall notify the Architect/Engineer and secure written approval and agreement on necessary adjustments before the installation is started.

D. Discrepancies shown on different plans or between plans and actual field conditions or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision.

E. The Contractor shall consider and review the complete set of documents, etc., Architectural, Structural, Mechanical, Electrical, etc., (Drawings and Specifications) as a complete set. They will be responsible for any and all electrical work shown or stated (to be by the Contractor), to include this work in their bid and install such items even though they are not specifically shown or stated on the Electrical section of the plans and specifications.

F. The drawings are indicative of the work to be installed, but do not show all bends, fittings, boxes and specialties required to complete the installation.

G. All conduits, wires, outlets boxes, switches, receptacles, devices and fixtures shall be included in the work.

H. Where it is stated that the Contractor shall “provide” a device or piece of equipment, it shall mean that such a device or equipments are finished and installed.

1.12 **CUTTING, PATCHING, AND FIRESTOPPING:**

A. The Electrical Contractor shall set all sleeves in construction for their Work.

B. Where cutting is required, it shall be done by the Electrical Contractor.

C. All patching shall be done by Electrical Contractor.

D. All conduit and outlet installations and cutting of any kind must be done with great care so as not to leave unsightly surfaces which may not be entirely concealed by plates, escutcheons, or their normal concealing construction, if such unsightly conditions occur, Electrical Contractor will be required, at their own expense, to replace the damaged construction.

E. This Electrical Contractor shall provide and install firestopping materials per Section 07 8400 - Firestopping.

1.13 SCAFFOLDING:

A. Furnish and erect all scaffolding, ladders, etc., required in the installation of wiring, equipment and fixtures.

1.14 ADDITIONAL ELECTRICAL COSTS:

A. If the Mechanical Contractor substitutes equipment for specified units, the mechanical contractor shall be responsible for any additional electrical installation costs for this substitution whether the other equipment was listed as equal in the specification or was approved equal after the project was in the bidding process.

1.15 GUARANTEE:

A. This Contractor shall be responsible for the proper installation and working of everything in this contract and shall guarantee to remedy free of charge any defects in workmanship and materials that may appear to give or gives rise to trouble of any kind for a period of one year from date of final substantial completion.

PART 2 NOT USED

PART 3 EXECUTION

3.1 EQUIPMENT CONNECTIONS:

A. Provide necessary power wiring for equipment furnished by others. Verify requirements with the Contractors responsible to supply each piece of equipment. Provide heavy duty disconnect switches as indicated.

3.2 AS-BUILT DRAWINGS:

A. Contractor shall keep an accurate record of all deviations from contract drawings and specifications. Edits shall neatly and correctly enter in colored crayon any deviations on drawings affected, and shall keep drawings available for inspection. Extra set of drawings will be furnished for this purpose.

B. At the completion of the job, and before final acceptance, the Contractor shall provide a complete set of as-built drawings. The Contractor shall show locations for all major electrical devices, including panelboards and all major runs of conduit, the circuiting of each fixture, outlet, etc., shall be shown. Certify to the accuracy of each print, by signature thereon, and deliver same to Architect.

END OF SECTION

Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Heat shrink tubing.

F. Oxide inhibiting compound.

G. Wire pulling lubricant.

H. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

J. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

L. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

M. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

Q. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

U. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

V. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables according to manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

(1) Maximum Length: 6 feet.

b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.

(1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2. In addition to other applicable restrictions, may not be used:

a. Where not approved for use by the authority having jurisdiction.

b. Where exposed to damage.

c. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

d. For isolated ground circuits, _____.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.

a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:

(1) Services: Copper conductors size 1/0 AWG and larger.

(2) Feeders: Copper conductors size 1/0 AWG and larger.

b. Where aluminum conductors are substituted for copper, comply with the following:

(1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.

(2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.

(3) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded according to ASTM B801 unless otherwise indicated.

H. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

2. Control Circuits: 14 AWG.

I. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 208Y/120 V, 3 Phase, 4 Wire System:

(1) Phase A: Black.

(2) Phase B: Red.

(3) Phase C: Blue.

(4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

c. Travelers for 3-Way and 4-Way Switching: Pink.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Stranded.

b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN-2, except as indicated below.

a. Size 4 AWG and Larger: Type XHHW-2.

b. Installed Underground: Type XHHW-2.

2.4 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:

1. Size 10 AWG and Smaller: Stranded.

2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.5 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

a. Push-in wire connectors are not permitted.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors.

3. Connectors for Aluminum Conductors: Use compression connectors.

C. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

3. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.

4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.

5. Aluminum Conductors: Use compression connectors for all connections.

D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.6 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Suitable for use at installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables according to NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 feet of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits according to NFPA 70.

6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

b. Increase size of conductors as required to account for ampacity derating.

c. Size raceways, boxes, etc. to accommodate conductors.

7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products according to manufacturer's instructions.

C. Perform work according to NECA 1 (general workmanship).

D. Install aluminum conductors according to NECA 104.

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables according to NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):

a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures according to NFPA 70.

L. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

Section 26 05 26 - Grounding and Bonding for Electrical Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

    a. Provide continuous grounding electrode conductors without splice or joint.

    b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

    a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

    b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

    c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

    a. Provide connection to metal in-ground support structure that is in direct contact with earth according to NFPA 70.

4. Concrete-Encased Electrode:

    a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth according to NFPA 70.

5. Ground Rod Electrode(s):

    a. Provide two electrodes unless otherwise indicated or required.

    b. Space electrodes not less than 10 feet from each other and any other ground electrode.

    c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

    a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

    b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

    c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

8. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

E. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

F. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.

2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

G. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and according to NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally according to NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems according to NFPA 70. This includes, but is not limited to:

a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

b. Metal gas piping.

H. Communications Systems Grounding and Bonding:

1. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.

b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

(1) Use bare copper conductors where installed underground in direct contact with earth.

(2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions.

B. Perform work according to NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep according to NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep according to NFPA 70.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected according to manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components according to Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

C. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

Section 26 05 29 - Hangers and Supports for Electrical Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.5 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

2. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

3. Do not use products for applications other than as permitted by NFPA 70 and product listing.

4. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated according to ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication according to ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Sheet Metal: Use sheet metal screws.

8. Wood: Use wood screws.

9. Plastic and lead anchors are not permitted.

10. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

a. Manufacturer: Same as manufacturer of metal channel/strut framing system.

b. Comply with MFMA-4.

c. Channel Material: Use galvanized steel.

11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mounting surfaces are ready to receive support and attachment components.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions.

B. Install hangers and supports according to NECA 1.

C. Install anchors and fasteners according to ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 4 inches in height; see Section 03 30 00.

5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

E. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

2. Obtain permission from Architect before drilling or cutting structural members.

F. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors.

H. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

Section 26 05 33.13 - Conduit for Electrical Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel intermediate metal conduit (IMC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Galvanized steel electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Reinforced thermosetting resin conduit (RTRC).

I. High-density polyethylene (HDPE) conduit.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 84 00 - Firestopping.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.

D. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); 2016.

E. ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct; 2017.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

J. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

K. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

L. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

M. NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit; 2021.

N. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

Q. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

R. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

S. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

T. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

U. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

V. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.

W. UL 746C - Polymeric Materials – Use in Electrical Equipment Evaluations; Current Edition, Including All Revisions.

X. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Y. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

Z. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings according to manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, rigid PVC conduit, or high-density polyethylene (HDPE) conduit.

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, rigid PVC conduit, or high-density polyethylene (HDPE) conduit.

3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.

4. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.

2. Within Slab Above Ground: Not permitted.

3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or aluminum rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

1. Locations subject to physical damage include, but are not limited to:

    a. Where exposed below 12 feet, except within electrical and communication rooms or closets.

    b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or Schedule 40 PVC.

M. Corrosive Locations Above Ground: Use aluminum rigid metal conduit.

N. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet.

O. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet unless otherwise indicated.

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 1/2 inch (16 mm) trade size.

2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.

3. Control Circuits: 3/4 inch (21 mm) trade size.

4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.

5. Underground, Interior: 1 inch (27 mm) trade size.

6. Underground, Exterior: 1 inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube and Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.

b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

3. Material: Use steel or malleable iron.

4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:

1. Allied Tube and Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Nucor Tubular Products: www.nucortubular.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

3. Material: Use steel or malleable iron.

4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.5 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Robroy Industries: www.robroy.com/#sle.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

D. PVC-Coated Boxes and Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.

2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.

3. Material: Use steel or malleable iron.

4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

E. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.6 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.

2. Electri-Flex Company: www.electriflex.com/#sle.

3. International Metal Hose: www.metalhose.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:

1. Manufacturers:

a. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

b. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

2.7 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, a division of Atkore International: www.afcweb.com/#sle.

2. Electri-Flex Company: www.electriflex.com/#sle.

3. International Metal Hose: www.metalhose.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.8 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube and Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

4. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.9 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.11 HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT

A. Description: NFPA 70, Type HDPE high-density polyethylene solid-wall conduit complying with ASTM F2160 and NEMA TC 7; list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.

B. Joining Methods: Approved by HDPE conduit manufacturer.

C. Mechanical Fittings: Comply with ASTM F2176; list and label as complying with UL 651A.

2.12 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Adhesive for HDPE and RTRC Conduit:

1. Specifically designed for bonding dissimilar materials in lieu of transition fittings, including but not limited to polyethylene, fiberglass, PVC, aluminum, and steel; UL 746C recognized.

2. Approved by adhesive manufacturer for use with materials to be joined.

E. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

F. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions.

B. Install conduit according to NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) according to NECA 101.

D. Install intermediate metal conduit (IMC) according to NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit according to NECA 111.

G. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

a. Electrical rooms.

b. Mechanical equipment rooms.

c. Within joists in areas with no ceiling.

5. Unless otherwise approved, do not route exposed conduits:

a. Across roofs.

b. Across building exterior surfaces.

6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

9. Route conduits above water and drain piping where possible.

10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

12. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:

a. Heaters.

b. Hot water piping.

c. Flues.

13. Group parallel conduits in same area on common rack.

H. Conduit Support:

1. Secure and support conduits according to NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.

    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use conduit clamp to support single conduit from beam clamp or threaded rod.

7. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

8. Use of wire for support of conduits is not permitted.

I. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

7. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Provide suitable sealing system where conduits penetrate exterior wall below grade.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

K. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 24 inches.

b. Under Slab on Grade: 12 inches to bottom of slab.

2. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 05 53.

L. Telecommunications Conduit:

1. Provide 3/4" empty conduit with proper mud ring or box stubbed up into corridor ceiling space for all voice, data, and television locations.

M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 30 00.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated according to NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where calculated according to NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.

4. Where conduits are subject to earth movement by settlement or frost.

O. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

a. Where conduits enter building from outside.

b. Where service conduits enter building from underground distribution system.

c. Where conduits enter building from underground.

d. Where conduits may transport moisture to contact live parts.

2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

a. Where conduits pass from outdoors into conditioned interior spaces.

b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

3. Where conduits cross boundaries of hazardous/classified locations, provide identified/listed sealing fittings or conduit mechanical seals as approved by authorities having jurisdiction; locate as indicated or according to NFPA 70.

P. Provide grounding and bonding; see Section 26 05 26.

3.3 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

END OF SECTION

Section 26 05 33.16 - Boxes for Electrical Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 27 26 - Wiring Devices:

1. Wall plates.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products according to manufacturer's instructions.

B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.

4. Use suitable masonry type boxes where flush-mounted in masonry walls.

5. Use raised covers suitable for the type of wall construction and device configuration where required.

6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

12. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

3. Junction and Pull Boxes Larger Than 100 cubic inches:

a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions.

B. Install boxes according to NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances according to manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Box Locations:

1. Locate boxes to be accessible. Provide access panels according to Section 08 31 00 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes so that wall plates do not span different building finishes.

4. Locate boxes so that wall plates do not cross masonry joints.

5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.

G. Box Supports:

1. Secure and support boxes according to NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections according to NFPA 70. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

H. Install boxes plumb and level.

I. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

J. Install boxes as required to preserve insulation integrity.

K. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

M. Close unused box openings.

N. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

O. Provide grounding and bonding according to Section 26 05 26.

P. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION

Section 26 05 53 - Identification for Electrical Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

E. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Panelboards:

(1) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

(2) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

b. Enclosed switches, circuit breakers, and motor controllers:

(1) Identify voltage power source and circuit number. Include location when not within sight of equipment.

(2) Identify load(s) served. Include location.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, according to NFPA 70.

4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

7. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

    a. Service equipment.

8. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

9. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Devices:

1. Use identification label to identify fire alarm system devices.

2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

    a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:

    a. Indoor Clean, Dry Locations: Use plastic nameplates.

    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend:

a. Equipment designation or other approved description.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:

a. Equipment Designation: 1/2 inch.

5. Color:

a. Normal Power System: White text on black background.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

1. Tape for Buried Power Lines: Black text on red background.

2.5 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.

7. Conductors and Cables: Legible from the point of access.

8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

Section 26 05 83 - Wiring Connections

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 05 33.13 - Conduit for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 27 26 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wiring Devices: As specified in Section 26 27 26.

C. Flexible Conduit: As specified in Section 26 05 33.13.

D. Wire and Cable: As specified in Section 26 05 19.

E. Boxes: As specified in Section 26 05 33.16.

2.2 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections according to equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

Section 26 09 23 - Lighting Control Devices

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Outdoor photo controls.

C. Daylighting controls.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems

B. Section 26 05 33.16 - Boxes for Electrical Systems.

C. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.

E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

F. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Field Quality Control Reports.

C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Lighting control devices shall be Buy American Act (BAA) compliant.

2.2 OCCUPANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.

2. Sensor Technology:

a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.

b. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.

4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.

5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

c. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

C. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

d. Finish: White unless otherwise indicated.

D. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.

2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

4. Load Rating: As required to control the load indicated on drawings.

2.3 OUTDOOR PHOTO CONTROLS

A. Stem-Mounted Outdoor Photo Controls:

1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.

2. Housing: Weatherproof, impact resistant polycarbonate.

3. Photo Sensor: Cadmium sulfide.

4. Provide external sliding shield for field adjustment of light level activation.

5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

6. Voltage: As required to control the load indicated on the drawings.

7. Failure Mode: Fails to the on position.

8. Load Rating: As required to control the load indicated on the drawings.

9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

2.4 DAYLIGHTING CONTROLS

A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.

1. Sensor Type: Filtered silicon photo diode.

2. Sensor Range:

a. Indoor Photo Sensors: 5 to 100 footcandles.

3. Finish: White unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors according to NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install lighting control devices according to NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices according to manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate according to Section 26 27 26.

G. Provide required supports according to Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

L. Daylighting Control Photo Sensor Locations:

1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.

2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

N. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

F. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.4 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

END OF SECTION

Section 26 09 43 - Lighting Control System

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Low voltage lighting control system and associated components:

1. Main units.
2. Control stations.
3. Wired sensors.
4. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 2726 - Wiring Devices:

1. Finish requirements for wall controls specified in this section.

C. Section 26 5100 - Interior Lighting: Luminaires and associated components, for interface with lighting control system.

1.3 REFERENCE STANDARDS

A. ISO 9001 - Quality Management Systems-Requirements.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association.

D. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall controls with actual installed door swings.
3. Coordinate the work to provide luminaires and lamps compatible with the lighting controls to be installed.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install sensors and wall controls until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging according to manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1. System Requirements , Unless Otherwise Indicated:

a. Ambient Temperature:

(1) Lighting Control System Components, Except Those Listed Below: Between 32 and 104 degrees F.

b. Relative Humidity: Less than 90 percent, non-condensing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Intelligent Lighting Controls, Inc.

B. Substitutions: See Section 01 6000 - Product Requirements.

1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by Architect a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

2. By using pre-approved substitutions, Contractor accepts responsibility and associated costs for all required modifications to related equipment and wiring. Provide complete engineered shop drawings (including power wiring) with deviations from the original design highlighted in an alternate color for review and approval by Architect prior to rough-in.

C. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

C. System shall be Buy American Act (BAA) compliant

D. Device Finishes:

1. Wall Controls: Match finishes specified for Wiring Devices in Section 26 2726, unless otherwise indicated.

2.3 PROGRAMMABLE LIGHTING CONTROL PANELS

A. Hardware Features:

1. Controller Back-Box: Each programmable lighting controller shall be provided with a factory furnished; UL listed NEMA 1 enclosure designed for wall mounting. Back-box must be capable of being shipped ahead of controller chassis insert to allow for rough-in of all electrical connections prior to receipt of the controller chassis insert.

2. Controller Chassis Insert: Each programmable lighting controller shall be provided with a factory or field installable controller chassis insert. Controller chassis insert shall contain all controller electronics, power supplies, relays, contactors and other required components. Controller chassis inserts shall arrive at the project site completely pre-wired and requiring only the connection of lighting circuits and control devices.

3. Line Voltage / Control Voltage Separation: Each programmable lighting controller shall be provided with a mechanical barrier that separates all line voltage components and wiring from all control voltage components and wiring. An additional barrier may be installed within the line voltage section that shall provide isolation between normal and emergency circuits where required.

4. Controller Covers: Each programmable lighting controller shall be provided with a dead front screw-held or hinged locking cover that is designed for either surface or flush mounting. If a hinge locking door is provided, it shall be provided with a slam-latch with 2 keys and door hooks to assist in mounting.

B. Electrical

1. Controller Power Supply: Each programmable lighting controller shall be provided with a dual-rated, UL listed Class 2 transformer capable of either 120/277 VAC or 120/347 VAC primary (50 to 60 Hz). It shall contain an internal self-resetting fuse.

2. Connections: All connections shall be made to clearly and permanently labeled termination points.

C. Controller Electronics:

1. Controller CPU: Each programmable controller shall be provided with a CPU (Central Processing Unit) that shall provide all the programming and control functions for the entire controller.

2. Real-Time Clock: Each controller shall be provided with a Real-Time Clock used to perform all time-controlled functions. It shall use a high voltage line-sync circuit for timing and a crystal for backup. Clock accuracy shall be held +/- 2 minutes per year and displayed to the second with the line-sync setting. Real-Time Clock functions shall include time of day, day of week, date and automatic daylight saving time and leap year adjustments. Time clock shall be protected against loss of time during a power outage for a period of up to 45 days without power of any type. Daylight Saving Time shall be adjustable with an enable/disable feature. Systems relying on a single clock device shall not be acceptable.

3. Relay Driver Module: Relay output cards shall be provided to expand the controller capability from 8 to 64 relay outputs in increments of 8. Electronics shall feature surge protection and optic-isolation. It shall also provide an interface for mounting input boards.

4. Relay Control Switches: Controller shall contain push-button switches to turn all relays ON or OFF without the presents of any programming.

5. Back-up and Restore: The controller shall be equipped with an internal memory backup and restore capability. It shall have the ability to backup all internal programming into additional onboard memory, verify present programming with backup, and restore programming.

6. Runtime Logging: The controller shall be equipped with memory to log the runtime of each relay. It shall be capable of storing up to 30 days or 1092 hours of data and be able to be exported in a delimitative format.

7. Non-Volatile Memory: Controller shall contain a minimum of 4 Mb of non-volatile EEPROM memory with a data retention of >200 years and electrostatic discharge protection of >4000V.

8. Power Input Surge Suppression: The controller’s 24VAC power input shall be equipped with double surge suppression to protect the electronics from transient over-voltages. Protection shall clamp over-voltages up to 123 volts.

9. Data Line Surge Suppression: The controller data line communications shall be equipped with transient voltage suppression protection that will protect the electronics from electrostatic discharge and other transient over-voltages. Protection shall clamp transients up to 8kv direct discharges and 15kv air discharges.

10. Data Line Communications: The controller shall be equipped with serial communications through RJ45 connectors for communicating on CAT-5 cable with other panels and LightSync devices. It shall also be equipped with a separate local port for communicating with LightSync devices. The communications shall consist of 2-RS485 data lines.

11. USB Serial Communications: A USB port shall be provided for programming and interfacing the system with the use of a personal computer.

12. TCP/IP Communications: A TCP/IP port shall be provided for programming and interfacing the system with a personal computer over a network (LAN) or the internet (WAN).

13. Optional Module Interface: The controller shall contain 4 ports for interfacing optional modules which includes communications and power. Optional modules shall be able to be mixed on each controller.

D. Switching and Control Devices:

1. Device Node Capacity: The lighting controller shall support switch input control of up to 64 data line LightSync devices locally per panel and 254 per network for up to 16,510 devices. The first 8 device nodes shall be powered by the lighting controller. The addition of a power supply or power supply/repeater shall be required for each additional 20 device nodes. Each LightSync device shall have a unique address and shall be capable of being programmed to the applicable functions described in the Switched Input Types heading in this specification.

2. Data Line Media: The data line shall consist of RS485 communications protocol transmitted over CAT-5, CAT-5E, or CAT-6 Cable. The cable shall have male RJ45 connectors installed on each end for interfacing controllers and LightSync devices. Both daisy chain and “T” (3 direction branching) of cable runs shall be permitted. “T” branching shall be accomplished by the addition of power supply/repeaters. It shall be able to be wired in a home run configuration for LightSync devices by the addition of a LightSync Hub.

3. LightSync Switch Stations: LightSync data line switch stations shall be available in momentary push button (1-6 switches and pilots) and each switch shall have an associated pilot light. Each button shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. There shall be an option to program each pilot LED to indicate the state of any relay, group, preset, and static on or off. It shall also have the capability to reverse the status: LED is ON if the relay is OFF etc.

4. LightSync Photocell Controllers: The photo controller shall be provided with 256 light to dark levels (0-1800fc). It shall allow selection of 8 individual set points for OFF and ON and includes a selectable range of dead-band. It shall be programmable for 2 or 30 seconds delay. Each set point shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network.

5. LightSync Input Modules: The input module shall provide 4 inputs that accepts momentary, momentary PB and maintained switch closures. Each input shall be optically isolated and have the ability to accept dry contact closures or 12-24VDC signals. Each input shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. It shall provide four pilot outputs that provide true status of relays, groups and presets. It shall be installed in the control panel or remote mounted.

6. LightSync Disable Key Switch: The disable switch shall provide a RJ45 connector that shall disable all LightSync devices down line with the closure of a key switch. It shall also provide two RJ45 connectors to pass data through. It shall indicate with an LED when the disable switch is active.

7. LightSync Occupancy Sensor Input Module: The occupancy sensor input module shall provide power and inputs for motion sensors. It shall have 4 or 8 independent inputs that shall be able to interface multiple sensors. Each input shall control any or all of the relays in the lighting controllers or the dimmer outputs on the network. It shall be installed in the control panel or remote mounted.

8. LightSync 0-10V Dimmer Output Module: The 0-10VDC dimmer output module shall be designed to control dimmable ballasts or other 0-10VDC devices. Each module shall have 4 independent output channels that can control up to 200 devices per output at .5mA per device. It shall have the capability to vary its level 256 steps between 0 and 10VDC. It shall be able to respond to photo controllers, switch inputs, DMX512 signals, and timers. It shall be installed in the control panel or remote mounted.

9. LightSync Motor Control Output Module: The motor control output module shall be designed to control shade motors, louver motors, blind motors, skylights, or any other class 2 DC motors. Each module shall have 4 independent outputs that can be controlled by a switch input, photocell, or timer. The control time shall be selectable from .1 to 300 seconds. Each lighting controller shall handle up to 8 modules with 4 outputs on each. Each output shall be equipped with a limit switch input for each direction of the motor.

10. Graphical Touch Screen Control Station: The Touch screen control station shall display the status and control the lighting control panel relay outputs via preprogrammed control objects on standard or custom bitmap screens.

E. Programming: Programmable controllers shall be capable of being programmed, monitored, backed-up, or controlled through any of the below methods. All programming changes shall take effect immediately as they are programmed and shall not suspend or disable switches or other system functions. The same functions shall be available for any of the connection types.

1. Local Keypad and Display: The system user shall be able to program, monitor and control any of the controller features and functions through the use of simple menu-driven self-prompting user interface consisting of a 4-line 20-character backlit LCD display and 8 selection keys that change function based on the current operating mode.

2. USB Serial Direct Connect: The system user shall be able to program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a USB port from a PC.

3. Modem Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC/modem on an analog phone line.

4. TCP/IP Connect: The system user shall be able to remotely program, monitor or control any of the controller features and functions utilizing LightLEEDer Pro Windows-based graphical user interface software using a PC with TCP/IP on a LAN or WAN.

F. Diagnostics: Programmable controllers shall have the ability to do the following diagnostics.

1. Power Status: Each programmable lighting controller shall be provided with an LED on the controller and each output board that shall indicate that power is present.

2. Keypad: System users shall be able to view through the keypad the current status of any relay, input, group, or preset and force any ON or OFF.

3. Software: System users shall be able to view through the LightLEEDer Pro software the current status of any relay, input, group, or preset and force any ON or OFF. It shall also have the ability to scan the network for devices and controllers and then poll them to verify network quality.

4. Relay Cycle Test: The controller shall have a cycle test for relays to turn them off/on/off and then return them to the original state to verify proper operation. It shall display the results for each relay for turning the relay ON and OFF.

5. Device Finder: It shall have the capability through the keypad to find LightSync devices, dimmer devices, and motor devices on the network.

6. Switch Test Mode: It shall be able to enter a switch test mode, where a switch input status LED will light when switch inputs are activated. It shall disable normal control when in this mode.

7. Demo Clock: It shall have the ability to speed the clock's time by 10, 30, or 60 times for testing timer functions.

G. Power Failure and Power-Up: Each programmable lighting controller shall be provided with circuitry that shall automatically shut down the controller whenever the incoming power fails to be delivered to the controller within required limits. When power is returned to the controller, one of the following power-up modes will be implemented for each controlled relay output in the system.

1. No Action: Upon restoration of incoming control power, the controller electronics shall be restarted and resume normal operations and all circuits will be maintained in the condition they were last in.

2. Turn ON: Controller shall turn the selected relay output to the ON state after power-up.

3. Turn ON if Input Closed: Controller shall turn the selected relay output to the ON state after power-up if local input selected is closed. It shall be able to select any input to monitor.

4. Turn OFF: Controller shall turn the selected relay output to the OFF state after power-up.

5. Turn OFF if Input Closed: Controller shall turn the selected relay output to the OFF state after power-up if local input selected is closed. It shall be able to select any input to monitor.

6. On if Open Time, OFF if Closed Time: Controller shall turn the selected relay output to the ON state during Open hours and shall turn selected relay outputs to the OFF state during Closed hours. This shall be used in conjunction with OPEN/CLOSED timers.

7. OFF if Open Time, ON if Closed Time: Controller shall turn the selected relay output to the OFF state during Open hours and shall turn selected relay outputs to the ON state during Closed hours. This shall be used in conjunction with OPEN/CLOSED timers.

8. Time of Day: Controller shall turn the selected relay output to the ON or OFF state based on the time of day in 30 minute increments for every day of the week.

H. Presets: The lighting controller shall support up to 256 user-defined presets of ON/OFF relay patterns. The presets shall be invoked by switch or timer actuation.

I. Descriptive Names: The system shall support the optional assignment of descriptive names (up to 10 characters) to the lighting controller, relay outputs, relay groups, inputs, timers, and presets. These names shall be able to switch from custom names to default names.

J. Password Protection: Each Programmable controller shall have user definable 6 digit alphanumeric passwords with 2 levels of access. It shall have control and edit for level 1 and control only access for level 2.

2.4 LIGHTING CONTROL RELAYS:

A. Reliant40-1 Single Pole Relay

1. Listing: Lighting control relays shall be individually UL and CUL listed and shall bear labels indicating compliance.

2. Labeling: Lighting control relays shall bear labels for relay current and SCCR ratings.

3. Endurance: Lighting control relays shall be designed and tested to have a minimum cycle life of 200,000 ON/OFF cycles @ FULL LOAD and 2,000,000 ON/OFF cycles at no load.

4. SCCR: Lighting relays shall have a SCCR rating of 18,000 amps up to 347 VAC.

5. Loads: Lighting control relays shall be designed for control of 120, 277 or 347 VAC lighting control circuits at a full 40 AMPS for Tungsten or Ballast loads, 16 AMPS for Electronic Ballasts (UL limit), and motor loads of 1.5 Hp @ 120 VAC.

6. Latching: Lighting control relays shall be designed with a latching mechanism that shall hold the relay in its last activated state indefinitely, with no change of state during an interruption of power. Solid state or electrically held relays are not acceptable.

7. Auxiliary Contacts: Each Lighting control relay shall contain an auxiliary set of contacts rated at 1 AMP 30 VAC/VDC electrically isolated but mechanically linked to the main contacts for the purpose of true status monitoring and pilot light activation.

8. Mounting: Relays shall be capable of panel mounting.

9. Lock-Out: Relays shall be equipped with an Enable/Disable switch to lock out On/Off control from the controller.

10. Actuator: Relays shall be equipped with a manual actuator switch for turning the relay ON or OFF along with status indication.

B. Reliant40-2 and 3 Pole Relay:

1. Multi-pole: Electrical contractor shall provide quantities of 40 AMP 2 or 3 pole relays as indicated on the drawings and schedules as specified herein.

2. Labeling: 40 AMP 2 or 3 pole relays shall be individually UL and CUL listed and shall bear labels indicating compliance.

3. Voltages: 40 AMP 2 or 3 pole contactors shall be designed for the control of 208, 240 and 480 VAC lighting loads at a full 40 Amps.

4. Mechanical Link: Poles within the contactor shall be electrically isolated but mechanically linked so as to open and close together without the possibility of one pole being closed while the other remains open. Systems that utilize two single-pole relays to accomplish this function are not acceptable.

2.5 CONTROL STATIONS

A. Provide control stations with configuration as indicated or as required to control the loads as indicated.

B. Wired Control Stations:

1. General Requirements:

a. Power: Class 2 (low voltage).

b. UL listed.

c. Provide faceplates with concealed mounting hardware.

d. Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.

e. Finish: As specified for wall controls in "Device Finishes" under DIGITAL NETWORK LIGHTING CONTROL SYSTEM - GENERAL REQUIREMENTS article above.

C. Infrared Handheld Controls:

1. Product(s):

a. Four-Scene Wireless Infrared Transmitter ; Lutron Model GRX-IT-WH: Operates up to 50 feet line-of-sight to receiver.

b. Single-Scene Wireless Infrared Transmitter ; Lutron Model C-FLRC-WH: Operates up to 12 feet line-of-sight to receiver.

2. Quantity: As indicated on the drawings.

3. Designed for use in conjunction with compatible infrared receiver and lighting control; compatibility dependent on that receiver, not transmitter.

4. Learnable by other variable frequency remote controls.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in a neat and workmanlike manner according to NECA 1 <http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=NECA NEIS 1> and, where applicable, NECA 130 <http://www.necanet.org/store/products/index.cfm/NECA 130-10> , except for mounting heights specified in those standards.

B. Install products according to manufacturer's instructions.

C. Define each dimmer/relay load type, assign each load to a zone, and set control functions.

D. Installation: Where shown on the drawings, the contractor shall furnish and install programmable lighting controllers of the quantities, sizes and types shown on the drawings or specified herein.

E. Requirements: All equipment shall be installed according to manufacturer requirements and in compliance with all applicable local and national codes and requirements.

F. Identify system components according to Section 26 0553.

3.3 MANUFACTURES SERVICES

A. Factory Programming: All controllers shall be factory programmed upon request according to the project specifications prior to shipment.

B. Installation Assistance: During the installation process, the manufacturer shall provide, at no cost, technical support via a toll-free telephone line to the installing contractor or owner’s representative to answer questions and supply additional information when required.

C. System Start-Up: The system manufacturer shall provide a factory authorized field technician to the project site after installation has been completed and prior to system being energized for the purpose of testing and adjustment of the system. Factory field technician shall test and verify all system functions and ensure proper operation of the system components according to the specifications and on-site conditions. The installing contractor shall notify the system manufacturer in writing that the system is completely wired and ready to be energized and tested 4 weeks prior to scheduling a field technician

for start-up of the system. Should the field technician arrive on the job site and find the installation incomplete, the installing contractor shall pay the cost of any future visits by the field technician required to complete the system start-up.

D. On-Site Programming: During the start-up procedure, the factory field technician shall provide programming assistance and guidance to the building operating personnel in order to program the systems for initial operation.

E. Instruction: During the start-up procedure, the factory field technician shall provide training to the building operating personnel in the operation, programming and maintenance of the lighting control system.

F. As-Built Drawings: After completion of the system installation and testing, the manufacturer shall provide 3 sets of “as-built” drawings.

G. Operation and Maintenance Manuals: After completion of the system installation and testing, the manufacturer shall provide 3 sets of Operations and Maintenance Manuals.

H. Lifetime Toll-Free Telephone Support: The system manufacturer shall provide a toll-free telephone number to the system user and shall allow access to free telephone support for the life of the system.

END OF SECTION

Section 26 21 00 - Low-Voltage Electrical Service Entrance

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.3 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:

1. Verify the following with Utility Company representative:

a. Utility Company requirements, including division of responsibility.

b. Exact location and details of utility point of connection.

c. Utility easement requirements.

d. Utility Company charges associated with providing service.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.

3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Contractor..

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:

1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.5 QUALITY ASSURANCE

A. Comply with the following:

1. IEEE C2 (National Electrical Safety Code).

2. NFPA 70 (National Electrical Code).

3. The requirements of the Utility Company.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products according to manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: Xcel Energy.

D. Division of Responsibility:

1. Pad-Mounted Utility Transformers:

a. Transformer Pads: Furnished and installed by Contractor per Utility Company requirements.

b. Transformers: Furnished and installed by Utility Company.

c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.

d. Primary: Confirm requirements with local utility

e. Secondary:

(1) Trenching and Backfilling: Provided by Contractor.

(2) Conduits: Furnished and installed by Contractor.

(3) Conductors: Furnished and installed by Contractor (Service Point at transformer).

2. Terminations at Service Point: Provided by Utility Company.

3. Metering Provisions:

a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products according to manufacturer's instructions and Utility Company requirements.

B. Perform work according to NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment components according to Section 26 05 29.

E. Provide grounding and bonding for service entrance equipment according to Section 26 05 26.

F. Identify service entrance equipment, including main service disconnect(s) according to Section 26 05 53.

END OF SECTION

Section 26 24 16 – Panelboards

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards according to manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully according to manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com.

D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

2. Listed series ratings are not acceptable.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized according to UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Load centers are not acceptable.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.

2. Ground Bus Material: Aluminum.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Copper.

3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

(1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

(2) 14,000 rms symmetrical amperes at 480 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Lug Material: Copper suitable for terminating copper conductors only.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

6. Provide the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

b. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

7. Do not use tandem circuit breakers.

8. Do not use handle ties in lieu of multi-pole circuit breakers.

2.6 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work according to NECA 1 (general workmanship).

B. Install products according to manufacturer's instructions.

C. Install panelboards according to NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances according to manufacturer's instructions and NFPA 70.

E. Provide required support and attachment according to Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide minimum of three spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding according to Section 26 05 26.

K. Install all field-installed branch devices, components, and accessories.

L. Provide filler plates to cover unused spaces in panelboards.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test according to NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1for all main circuit breakers. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Test AFCI circuit breakers to verify proper operation.

F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

Section 26 27 26 - Wiring Devices

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates and covers.

1.2 RELATED REQUIREMENTS

A. Section 26 05 33.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.2 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with stainless steel wall plate.

C. Wiring Devices Installed in Unfinished Spaces: White with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

E. Isolated Ground Convenience Receptacles: Orange.

F. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

2.3 WALL SWITCHES

A. Manufacturers:

1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

2. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20and where applicable FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

2.4 RECEPTACLES

A. Manufacturers:

1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

2. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498and where applicable FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

E. Controlled Receptacles:

1. Controlled Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification W-C-596. Controlled receptacle marking permanently printed, molded, or stamped on the face of the receptacle and in compliance with Controlled Receptacle Marking requirements stated in Article 406.3(E) of the 2014 National Electrical Code.

2.5 WALL PLATES AND COVERS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.

2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.

3. Lutron Electronics Company, Inc: www.lutron.com.

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

F. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

G. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors according to NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that openings in access floor are in proper locations.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work according to NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switches: 48 inches above finished floor to top of box.

b. Wall Dimmers: 48 inches above finished floor to top of box.

c. Receptacles: 20 inches above finished floor to top of box or 6 inches above counter.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles or wall switches are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices according to manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

Section 26 28 13 – Fuses

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.

2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Fuses: One set(s) of three for each type and size installed.

3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com/#sle.

B. Littelfuse, Inc: www.littelfuse.com/#sle.

2.2 APPLICATIONS

A. Individual Motor Branch Circuits: Class RK5 time-delay.

2.3 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

Section 26 28 16.16 - Enclosed Switches

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Project Record Documents: Record actual locations of enclosed switches.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully according to manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:

1. Comply with NEMA KS 1.

2. Conductor Terminations:

a. Lug Material: Copper suitable for terminating copper conductors only.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions.

B. Perform work according to NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances according to manufacturer's instructions and NFPA 70.

D. Provide required support and attachment according to Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding according to Section 26 05 26.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.3 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.4 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

Section 26 32 13 - Engine Generators

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:

1. Generator set enclosure.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

C. NEMA MG 1 - Motors and Generators; 2021.

D. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

G. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Manufacturer's factory emissions certification.

E. Source quality control test reports.

F. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:

1. Certified prototype tests.

2. Torsional vibration compatibility certification.

3. NFPA 110 compliance certification.

4. Certified rated load test at rated power factor.

G. Manufacturer’s detailed field testing procedures.

H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.

3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1. Authorized service facilities located within 200 miles of project site.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets according to manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully according to manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Kohler Power Systems; KG150-4R13X.

B. Packaged Engine Generator Set- Other Acceptable Manufacturers:

1. Blue Star Power Systems, Inc.
2. Caterpillar Inc: www.cat.com/#sle.
3. Cummins Power Generation Inc: www.cumminspower.com/#sle.
4. MTU Onsite Energy, a Brand of Rolls-Royce Power Systems; _____: www.mtuonsiteenergy.com/#sle.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:

1. Application: Emergency/standby.
2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:

1. Type: Gaseous (spark ignition).
2. Power Rating: As indicated on drawings, standby.
3. Voltage: 208Y/120 V, 3 phase, 60 Hz.
4. Main Line Circuit Breaker:
   a. Type: Thermal magnetic.
   b. Trip Rating: Select according to generator set rating.

E. Generator Set General Requirements:

1. Prototype tested according to NFPA 110 for Level 1 systems.
2. Factory-assembled, with components mounted on suitable base.
3. List and label engine generator assembly as complying with UL 2200.
4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:

1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.

2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.

3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).

4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:

1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.

2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.3 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):

1. Fuel Source: Propane (LP), vapor withdrawal.

2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.

3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:

a. Carburetor.

b. Gas pressure regulators.

c. Fuel shutoff control valves.

d. Low gas pressure switches.

C. Engine Starting System:

1. System Type: Electric, with DC solenoid-activated starting motor(s).

2. Battery(s):

a. Battery Type: Lead-acid.

b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.

c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.

3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.

4. Battery Charger:

a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.

b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.

c. Recognized as complying with UL 1236.

d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.

e. Provide integral DC output ammeter and voltmeter with five percent accuracy.

f. Provide alarm output contacts as necessary for alarm indications.

D. Engine Speed Control System (Governor):

1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.

2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:

1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:

1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.

2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:

1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.

2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

2.4 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:

1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.

2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.

3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

2.5 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.

2. Generator Set Control Functions:

    a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).

    b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.

    c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.

    d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.

    e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.

    f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).

    g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.

3. Generator Set Status Indications:

    a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.

    b. Current (Amps): For each phase.

    c. Frequency (Hz).

    d. Real power (W/kW).

    e. Reactive power (VAR/kVAR).

    f. Apparent power (VA/kVA).

    g. Power factor.

    h. Duty Level: Actual load as percentage of rated power.

    i. Engine speed (RPM).

    j. Battery voltage (Volts DC).

    k. Engine oil pressure.

    l. Engine coolant temperature.

    m. Engine run time.

    n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:

    a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:

        (1) Overcrank (shutdown).

        (2) Low coolant temperature (warning).

        (3) High coolant temperature (warning).

        (4) High coolant temperature (shutdown).

        (5) Low oil pressure (shutdown).

        (6) Overspeed (shutdown).

        (7) Low fuel level (warning).

        (8) Low coolant level (warning/shutdown).

        (9) Generator control not in automatic mode (warning).

(10) High battery voltage (warning).

(11) Low cranking voltage (warning).

(12) Low battery voltage (warning).

(13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:

(1) High AC voltage (shutdown).

(2) Low AC voltage (shutdown).

(3) High frequency (shutdown).

(4) Low frequency (shutdown).

(5) Overcurrent (shutdown).

c. Provide contacts for local and remote common alarm.

d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:

a. Event log.

2.6 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Convenience Receptacle: Weatherproof GFCI duplex rated at 20A.

2.7 SOURCE QUALITY CONTROL

A. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

B. Generator Set production testing to include, at a minimum:

1. Operation at rated load and rated power factor.

2. Single step load pick-up.

3. Transient and steady state voltage and frequency performance.

4. Operation of safety shutdowns.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work according to NECA 1 (general workmanship).

B. Install products according to manufacturer's instructions.

C. Install generator sets and associated accessories according to NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed according to Section 03 30 00.

F. Provide required support and attachment according to Section 26 05 29.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide engine exhaust piping according to Section 23 51 00, where not factory installed.

1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.

2. Do not exceed manufacturer's maximum back pressure requirements.

I. Provide grounding and bonding according to Section 26 05 26.

J. Identify system wiring and components according to Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:

1. Inspect each system component for damage and defects.

2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.

3. Check for proper oil and coolant levels.

G. Prepare and start system according to manufacturer's instructions.

H. Perform acceptance test according to NFPA 110.

I. Inspection and testing to include, at a minimum:

1. Verify compliance with starting and load acceptance requirements.

2. Verify voltage and frequency; make required adjustments as necessary.

3. Verify phase sequence.

4. Verify control system operation, including safety shutdowns.

5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

6. Perform load tests according to NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

J. Provide field emissions testing where necessary for certification.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of four hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

C. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.6 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

END OF SECTION

Section 26 36 00 - Transfer Switches

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:

1. Automatic transfer switches.

2. Includes service entrance rated transfer switches.

1.2 RELATED REQUIREMENTS

A. Section 26 32 13 - Engine Generators: For interface with transfer switches.

1. Includes code requirements applicable to work of this section.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

G. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

H. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 32 13.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches according to manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully according to manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transfer Switches - Basis of Design: _____.

B. Transfer Switches - Other Acceptable Manufacturers:

1. Same as manufacturer of engine generator(s) used for this project.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:

1. Utilize open transition transfer unless otherwise indicated or required.

D. Construction Type: Only "contactor type" (open contact) transfer switches are acceptable. Do not use "breaker type" (enclosed contact) transfer switches.

E. Automatic Transfer Switch:

1. Transfer Switch Type: Service entrance rated automatic transfer switch.

2. Transition Configuration: Open-transition (no neutral position).

3. Voltage: As indicated on the drawings.

4. Ampere Rating: As indicated on the drawings.

5. Neutral Configuration: Solid neutral (unswitched), except as indicated.

F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:

1. Open Transition:

a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.

2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Outdoor Locations: Type 3R or Type 4.

2. Provide lockable door(s) for outdoor locations.

3. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than 35,000 rms symmetrical amperes.

M. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.

2. Control Functions:

a. Automatic mode.

b. Test Mode: Simulates failure of primary/normal source.

c. Voltage and Frequency Sensing:

(1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.

(2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.

(3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:

(1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).

(2) Auxiliary contacts; one set(s) for each switch position.

e. Adjustable Time Delays:

(1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.

(2) Transfer to alternate/emergency source time delay.

(3) Retransfer to primary/normal source time delay.

(4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

4. Automatic Sequence of Operations:

a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.

b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.

c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.

d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Service Entrance Rated Transfer Switches:

1. Furnished with integral disconnecting and overcurrent protective device on the primary/normal source and with ground-fault protection where indicated.

2. Listed and labeled as suitable for use as service equipment according to UL 869A.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

B. Verify that rough-ins for field connections are in the proper locations.

C. Verify that mounting surfaces are ready to receive transfer switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work according to NECA 1 (general workmanship).

B. Install products according to manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Install transfer switches plumb and level.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Prepare and start system according to manufacturer's instructions.

C. Automatic Transfer Switches:

1. Inspect and test according to NETA ATS, except Section 4.

2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

END OF SECTION

Section 26 43 00 - Surge Protective Devices

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.3 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space according to manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Field-installed, Externally Mounted - Current Technology; a company of ABB; Model #CGP120-120/208-3GY; www.tnbpowersolutions.com. Without disconnect.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.
2. Delta Systems: L-G, L-L.
3. Single Split Phase Systems: L-N, L-G, N-G, L-L.
4. High Leg Delta Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):

1. Equivalent to basis of design.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

1. Indoor clean, dry locations: Type 12.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is according to Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work according to NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances according to manufacturer's instructions and NFPA 70.

C. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

D. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete according to Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.3 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

Section 26 51 00 - Interior Lighting

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts; 2023.

B. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.

C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

E. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each fixture that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings. Alternate light fixture data sheet shall be submitted to the Engineer for approval prior to bid. No exceptions.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested according to IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.4 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

B. Self-Powered Exit Signs:

1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

2. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

3. Provide low-voltage disconnect to prevent battery damage from deep discharge.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors according to NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment according to Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Install lamps in each luminaire.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.4 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.5 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. Just prior to Substantial Completion, replace all lamps that have failed.

3.7 SCHEDULE - SEE DRAWINGS

END OF SECTION

Section 26 56 00 - Exterior Lighting

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2022).

B. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

C. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

D. ANSI C82.4 - American National Standard for Lamp Ballasts - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps; 2017, with Editorial Revision (2022).

E. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts; 2023.

F. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

G. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

H. IES RP-8 - Recommended Practice: Lighting Roadway and Parking Facilities; 2022.

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

J. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1598 - Luminaires; Current Edition, Including All Revisions.

M. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.

2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Coordination: Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Any deviation from what is called out in the Light Fixture Schedule requires prior approval from the Engineer.

1. Provide Cut Sheets and Photometrics.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.
2. Tested according to IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Structural Design Criteria:
   a. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
   b. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
3. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
4. Unless otherwise indicated, provide with the following features/accessories:
   a. Top cap.
   b. Handhole.
   c. Anchor bolts with leveling nuts or leveling shims.
   d. Anchor base cover.

B. Metal Poles: Provide ground lug, accessible from handhole.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors according to NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires according to NECA/IESNA 501.

D. Provide required support and attachment according to Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Pole-Mounted Luminaires:

1. Foundation-Mounted Poles:

a. Provide cast-in-place concrete foundations for poles as indicated, according to Section 03 30 00.

(1) Install anchor bolts plumb per template furnished by pole manufacturer.

(2) Position conduits to enter pole shaft.

b. Install foundations plumb.

c. Install poles plumb, using leveling nuts as required to adjust to plumb.

d. Tighten anchor bolt nuts to manufacturer's recommended torque.

e. Install anchor base covers or anchor bolt covers as indicated.

2. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

K. Bond luminaires, metal accessories, and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting according to Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

F. Measure illumination levels to verify conformance with performance requirements. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.4 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and adjust luminaires to provide illumination levels and distribution indicated on Drawings.

3.5 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.6 CLOSEOUT ACTIVITIES

3.7 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.8 SCHEDULE - SEE DRAWINGS

END OF SECTION

Section 27 10 00 - Structured Cabling

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Communications equipment room fittings.

E. Communications outlets.

F. Communications grounding and bonding.

G. Communications identification.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products.

E. Section 26 27 26 - Wiring Devices.

F. Section 27 05 33.13 - Conduit for Communications Systems.

G. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.3 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. FM (AG) - FM Approval Guide; Current Edition.

D. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

G. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

H. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

I. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

J. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

K. UL (DIR) - Online Certifications Directory; Current Edition.

L. UL 444 - Communications Cables; Current Edition, Including All Revisions.

M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

N. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.

3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

F. Field Test Reports.

G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

1. Record actual locations of outlet boxes and distribution frames.

2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.

3. Identify distribution frames and equipment rooms by room number on drawings.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.6 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).

2. Supervisors and installers factory certified by manufacturers of products to be installed.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).

2. Comply with Communications Service Provider requirements.

3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.

4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.

5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:

C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.

1. Locate main distribution frame as indicated on the drawings.

D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.2 PATHWAYS

A. Conduit: See section 27 05 33.13.

B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

2.3 COPPER CABLE AND TERMINATIONS

A. Manufacturers:

1. Siemon Company; _____: www.siemon.com/#sle.

B. Copper Backbone Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.

2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.

3. Cable Capacity: Quantity of pairs as indicated on drawings.

4. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

C. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.

2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.

3. Cable Capacity: 4-pair.

4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

E. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.

1. Performance: 500 mating cycles.

2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

F. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2.4 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.

B. Cable Management:

2.5 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 05 33.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

B. Wall Plates:

1. Comply with system design standards and UL 514C.

2. Accepts modular jacks/inserts.

3. Capacity:

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 27 26.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with Section 26 05 53.

2.7 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform according to TIA-607 and NFPA 70.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.

2. 12 inches from power conduits and cables and panelboards.

3. 5 inches from fluorescent and high frequency lighting fixtures.

4. 6 inches from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

2. Do not over-cinch or crush cables.

3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 120 inches.

2. At Outlets - Copper: 12 inches.

C. Copper Cabling:

1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.

2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.

3. Use T568B wiring configuration.

D. Wall-Mounted Racks and Enclosures:

1. Install to plywood backboards only, unless otherwise indicated.

2. Mount so height of topmost panel does not exceed 78 inches above floor.

E. Identification:

1. Use wire and cable markers to identify cables at each end.

2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.

3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:

1. Inspect cable jackets for certification markings.

2. Inspect cable terminations for color coded labels of proper type.

3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:

1. Test backbone cables after termination but before cross-connection.

2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.

3. Category 3 Backbone: Perform attenuation test.

4. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

Section 27 51 16 - Public Address Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Amplifier and control equipment.

B. Input equipment.

C. Reproducer equipment.

D. Sound system cable.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SYSTEM DESCRIPTION

A. Public address system for music.

B. Input components:

1. Rack Mounted Media Player including but not limited to:

a. CD Player

b. AM/FM Tuner

c. Bluetooth Input

d. 3.5MM Auxillary input

C. Features:

1. Distribution of background music.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of field wiring to speakers and remote input devices.

C. Product Data: Provide data showing electrical characteristics and connection requirements for each component.

D. Test Reports: Indicate satisfactory completion of each test recommended by the manufacturer.

E. Manufacturer's Field Reports: Indicate that installation is complete and system performs according to specified requirements.

F. Project Record Documents: Record actual locations of speakers, control equipment, and outlets for input/output connectors.

G. Operation Data: Include instructions for adjusting, operating, and extending the system.

H. Maintenance Data: Include repair procedures and spare parts documentation.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70 and Federal Communications Commission.

B. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 200 miles of Project.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. JBL

B. Denon

2.2 AMPLIFICATION AND CONTROL EQUIPMENT

A. Mic/Line Level inputs

B. System Output Power: 120 watts per chanel

1. Supports 70/100V distributed speakers

C. Volume Controls: One for each input and one master volume.

D. System Cabinet: Rack mounted.

E. Product: JBL CSMA-2120 8x2 Mixer Amplifier

1. Substitutions: See Section 01 60 00 - Product Requirements

2.3 COMPONENTS

A. Rack Mounted Media Player:

1. AM/FM Tuner

a. FM receiving range - 87.5 MHz - 107.9 MHz

b. AM receiving range - 522 kHz - 1710 kHz

2. Bluetooth Input

3. Physical media Input

4. Product: Denon DN-300Z.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Speakers: 4 inch coaxial speaker with integral crossover circuit.

1. Power Rating: 80 watts.

2. 70V Taps: 30W, 15W, 7.5W and 3.7W

3. 100V Taps: 30W, 15W and 7.5W

4. Frequency Range: 80Hz - 20kHz.

5. Sound Pressure Level: 86 dB at 3 feet with 1 watt input.

6. Product: JBL Control 24CT.

7. Substitutions: See Section 01 60 00 - Product Requirements.

C. Equipment Rack: Wall mounted equipment rack.

1. Equipment rack provided by Division 27 1000.

2. Coordinate installation with Equipment Rack provider prior to rough-in.

2.4 WIRE AND CABLE

A. Input Cable: 22 AWG copper conductor, 300 volt insulation, rated 60 degrees C, paired conductors twisted together, shielded, and covered with a PVC jacket.

B. Plenum Cable for Speaker Circuits: 22 AWG copper conductor, 300 volt insulation, rated 200 degrees C, paired conductors twisted together shielded and covered with a nonmetallic jacket; suitable for use for Class 2 circuits in air handling ducts, hollow spaces used as ducts, and plenums.

1. Product: _____.

2.5 ACCESSORIES

A. Provide neccessary accessories and hardware for speaker installation into Drywall ceiling

1. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Coordinate speaker installation with Ceiling installer prior to rough-in.

C. Splice cable only in accessible junction boxes or at terminal block units.

D. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.

E. Install input circuits in separate cables and raceways from output circuits.

F. Provide protection for exposed cables where subject to damage.

G. Use armored cable for outside speaker circuits.

H. Support cables above accessible ceilings to keep them from resting on ceiling tiles. Use spring metal clips or plastic cable ties to support cables from structure for ceiling suspension system. Include bridle rings or drive rings.

I. Use suitable cable fittings and connectors.

J. Connect reproducers to amplifier with matching transformers.

K. Ground and bond equipment and circuits according to Section 26 05 26.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Measure and record sound power levels at designated locations.

3.3 ADJUSTING

A. Adjust transformer taps for appropriate sound level.

B. Adjust devices and wall plates to be flush and level.

3.4 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate operation of system to Owner's personnel.

1. Use operation and maintenance data as reference during demonstration.

2. Conduct walking tour of project.

3. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Location: At project site.

3.5 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of public address and music system for one year from Date of Substantial Completion.

END OF SECTION

Section 33 50 00 – LP Fuel Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

A. LP fuel tanks

B. Remote LP fuel monitor systems

C. LP fuel piping systems

D. LP fuel pressure regulators

E. Shut-off valves

1.2 RELATED REQUIREMENTS

A. Applicable provisions of Division 1 govern work under this section.

B. Section 26 32 13 – Engine Generators

1.3 REFERENCE STANDARDS

A. ANSIB16.3 – Malleable Iron Threaded Fittings.

B. ASTMA53 – Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

C. ASTMA234 – Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

D. AGA – American Gas Association

E. ANSI – American National Standards Institute

F. ASME – American Society of Mechanical Engineers

G. ASTM – American Society for Testing and Materials

H. AWS – American Welding Society

I. CGA- Compressed Gas Association

J. EPA – Environmental Protection Agency

K. GAMA – Gas Appliance Manufacturers Association

L. MCA – Mechanical Contractors Association

M. MSS – Manufacturer's Standard Society of the Valve and Fitting Industry

N. NBS – National Bureau of Standards

O. NEC – National Electric Code

P. NEMA – National Electrical manufacturers Association

Q. NFPA – National Fire Protection Association

R. UL – Underwriters Laboratories Inc.

1.4 SUBMITTALS

A. Refer to Division 1, General Conditions, Submittals.

B. Submit shop drawings and production information for the following items: LP tank, LP fuel gas piping, remote LP gas monitor system and LP fuel regulators.

C. Submit test report of installed LP fuel piping system.

D. For all equipment and systems as indicated in the respective sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number as indicated in the contract documents.

1.5 OPERATION AND MAINTENACE INSTRUCTIONS

A. All operations and maintenance instructions shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

1.6 QUALITY ASSURANCE

A. Supplier: Authorized supplier of LP fuel systems and fuel supply with service facilities within 100 miles of project site.

B. Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and according to the appropriate ASTM specification.

C. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the owner.

D. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.8 RECORD DRAWINGS

A. Refer to Division 1, General Requirements, Record Drawings.

B. Record as-built drawing locations of all installed below grade piping.

PART 2 PRODUCTS

2.1 LP FUEL TANK

A. Provide a new LP fuel storage tank of the size as indicated on the drawings. LP tank shall become the property of the State of Wisconsin and shall not be on lease/fill agreement with fuel supplier.

B. Tank shall be an above ground steel type with lockable cover all which are primed and painted suitable for outdoor environments.

C. Tank shall include direct read gauge to monitor fuel level.

2.2 REMOTE LP FUEL MONITOR SYSTEM

A. System shall be a hard wired local stationary tank monitor system with remote read out located within the equipment building. System shall include:

1. Remote monitor with field programmable high/low set points
2. RS232 interface to PC for programming/saving parameters
3. Alarm relay form “C:, 10A dry contacts
4. 120VAC power supply
5. Remote sensor at the tank with volume readout.

B. The system shall be a LevelCon Model#: STM94442A, or equivalent.

2.3 LP FUEL PIPING

A. All LP fuel piping components shall be specifically manufactured for use in LP fuel applications.

B. Below grade fuel piping shall be direct buried polyethylene tubing of the size indicated in the plans. Below grade tubing shall include tracer wire.

C. Provide anodeless meter risers at each end where LP fuel piping stubs up to generator and LP fuel tank. Anodeless meter risers shall include epoxy coated steel casing and be rated for 125 psig.

D. Above grade hard piping at generator and LP tank shall be steel gas rated piping which is primed and painted for outdoor environments.

E. Above grade piping at LP fuel tank from LP tank to anodeless meter riser shall be flexible LP fuel gas tubing rated for outdoor environments.

2.4 LP FUEL PRESSURE REGULATORS

A. Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150psi W.O.G., -20°F to 150°F.

B. Regulators shall be specifically manufactured for use in LP fuel applications. Size regulators as appropriate for piping sizes and anticipated pressure drops as noted on the plans.

2.5 SHUT-OFF VALVES

A. Two inch or smaller: Ball valve, bronze body, threaded ends, stainless steel or chrome plated ball, full or conventional port, Teflon seat, blowout-proof system, two-piece construction, suitable for 150psig working pressure, U.L. listed for use as LP gas shut-off.

PART 3 EXECUTION

3.1 LP FUEL TANK

A. Verify size of concrete foundation is suitable for tank to be installed. Install concrete foundation slab per the plans and specifications.

B. Mount tank on slab concrete slab and secure legs to slab with galvanized anchor bolts.

C. Connect tank leg(s) to site grounding system according to the plans and specifications. Grind paint on tank legs to ensure good ground continuity. Touch up paint connections to prevent rust or corrosion.

D. Install LP gas monitor system per these specifications.

E. Purge and fill tank to 80% of capacity with LP fuel. Fuel used during project construction is responsibility of the contractor. The tank shall be re-filled by contractor just prior to owner taking occupancy of the equipment building. After occupancy, fuel use will then become the responsibility of the owner.

3.2 REMOTE LP FUEL MONITOR SYSTEM

A. Trench and install conduit between LP tank and equipment building for hard wire leads as detailed in the plans. Install tracer wire. Support conduit above grade at LP tank per drawings.

B. Install remote LP gas monitor system per manufacturer’s instructions.

C. Mount remote monitor unit within the equipment building at the location as indicated in the drawings.

D. Seal conduits containing hard wire leads between LP tank and equipment building at both ends per drawings.

3.3 LP FUEL PIPING

A. Trench and install LP fuel piping between LP tank and generator as detailed in the drawings.

B. Install AGA approved ball shut-off valve at the generator.

C. Install LP fuel pressure regulators per manufacturers requirements at the locations noted in the drawings.

D. Provide fuel line support as noted in the drawings.

E. Provide sediment trap/dirt leg in hard piping at generator.

F. Install flexible LP fuel gas tubing between hard piping and generator for vibration isolation.

G. Air test fuel piping to ensure no leaks. Air test shall be at 100 psig for 24 hours. Repair as necessary. Document test results on attached form and submit results to A/E.

PIPING SYSTEM TEST REPORT

Date Submitted: _____

Project Name: _____

Location: Project No: _____

Contractor: _____

☐ **HVAC** ☐ **Refrigeration** ☐ **Controls**

☐ Power Plant ☐ Plumbing ☐ Sprinkler

Test Medium: ☐ Air ☐ Water ☐ Other _____

Test performed per specification section No. _____

Specified Test Duration _____ **Hours** **Specified Test Pressure** _____ **PSIG**

System Identification: _____

Describe Location: _____

Test Date: _____

Start Test Time: _____ *Initial Pressure:* _____ *PSIG*

Stop Test Time: _____ **Final Pressure:** _____ **PSIG**

Tested By: _____ *Witnessed By:* _____

Title: _____ *Title:* _____

Signed: _____ *Signed:* _____

Date: _____ *Date:* _____

Comments: _____

END OF SECTION

44. Electrical Service, Sparta Rest Area, Item SPV.0060.19.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide electrical service for the new Sparta Rest Area Building location according to the plans and as hereinafter provided. Electrical service shall include underground three-phase power to transformer(s) near the proposed building location including furnishing and installation of transformers and transformer pads; underground service to the new Rest Area building; wire and terminations at transformers and at meter sockets; and meters.

Site lighting, site telephone/internet/network service, and wiring and equipment within the Rest Area Building; electrical work and equipment from the meter socket, conduit, and electrical system terminations at the main switch(s); and exterior conduit stub from the meter are included under other bid items.

Non-metallic conduit required for crossing under paved areas is included under other bid items.

B Materials

The contractor shall provide two 6-inch conduit sweeps at the transformer location, two 5-inch conduits from the transformer location to the CT cabinet, and any base necessary for the transformer pad location.

C Construction

Contractor makes all arrangements and coordinates electric utility service work with Xcel Energy.

Utility provides and installs transformers and transformer pads; wire; and all terminations at tie-in to existing, at transformers and at meter socket; and provide and install the meters.

The contractor will be responsible for installing two 6-inch sweeps at the transformer location, two 5-inch conduits from the transformer location to the CT cabinet, and prepping the transformer pad location (grading, base, and compaction).

The electric utility company (Xcel Energy) charges will be paid for separately by the department.

Contractor includes all other work not completed by Xcel Energy but necessary for complete installation.

D Measurement

The department will measure Electrical Service, Sparta Rest Area by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.19	Electrical Service, Sparta Rest Area	EACH

Payment is full compensation for coordinating overhead and/or underground electric service from existing source to the transformer(s) at the proposed locations, to the Rest Area building and meter.

45. Sewage Ejector Pump and Controls, Item SPV.0060.20.

A Description

A.1 General

Furnish and install a submersible sewage ejector pump, complete with piping, valves, fittings, electrical connections and controls, floats switches and appurtenances into manhole S.1 which serves the maintenance building as shown on the plans. Equipment furnished shall be of latest and most modern design; components shall be current models at time of bidding. Contractor shall be responsible for all details as required, including any undesignated items necessary for a complete installation, properly installed and ready for operation.

A.2 Shop Drawings

Submit 4 sets of shop drawings for equipment for approval by the engineer. Furnish the following information:

- Manufacturer's product data and specifications.
- Performance data. Drawings showing general dimensions, openings, connections, components, wiring and piping schematics, templates, and construction details.
- Recommended installation procedures. Motor efficiencies and power factors at all design operating points.

After approval of shop drawings, submit 4 complete bound sets of O/M manuals; include the following:

- Operation/maintenance instruction bulletins.
- Complete parts list for each equipment item.
- Wire lists and wiring diagrams for all panels.
- Approved shop drawings with noted corrections and field modifications.

A.3 Warranty

Pump manufacturer shall warrant the pumps being supplied against defects in workmanship and materials for a period of 5 years under normal use, operation, and service. Plug valves and check valves shall be warranted by manufacturer against defects in workmanship and materials for a period of 1 year under normal use, operation, and service. Submit one copy of each manufacturer warranty to the engineer.

B Materials

B.1 Sewage Ejector Pump, General

Provide totally submersible electrically operated pumps with hydraulic sealing discharge connection, pump guide rails, pump mounting bracket, guide rail supports, and pump lifting chains with hooks in a concrete chamber. Provide piping and accessories, as designated. Design shall be such that pump will be automatically connected to discharge piping when lowered into place. Pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastening devices to be removed, and no need for personnel to enter pump well. Pump guide rails and guide brackets shall be non-sparking type; stainless steel rails with brass bushing.

B.2 Pump

Pump shall be sealed submersible type, as manufactured by Flygt, Hydromatic or approved equal, sized for this application. Pump volute, motor, and seal housing shall be of cast iron construction ASTM A-48, Class 25. Pumps shall have double mechanical seals and stainless steel fasteners and hardware. All pump parts coming into contact with sewage shall be protected by a coat of alkyd enamel paint.

B.3 Motors

Motors shall have cooling characteristics suitable to permit continuous operation in totally, partially and non-submerged conditions. Motors shall have an integral overload element imbedded in the winding to protect the motor against overcurrent and overheating due to overload and failure to start. Overload element shall automatically reset when motor cools. Motor power shall be adequate so that the pumps are non-overloading throughout the entire pump performance curve from shut off through run out.

B.4 Motor Power and Control Cables

The motor power and control cables shall be supplied by the pump supplier. Power cable shall be type SO with ground wire, size as recommended by the manufacturer and as required by code. Control cables shall be type SJO, size and number of conductors as required to perform functions specified. Cables shall be potted into a steel connector with polyurethane resin, or other suitable means shall be used to provide a leakproof seal. Power cable and control wiring shall be of sufficient length to reach control panel without splices and shall allow complete removal of pumps from tank without disconnection of wiring.

C Construction

C.1 Installation

Install pumps according to approved shop drawings and manufacturer's recommendations. Mount as indicated on the plans or as specified by the engineer.

C.2 System Tests

Prior to acceptance, conduct an operational test, under observation of engineer, to demonstrate that installed equipment meets purpose and intent of specifications. Performance shall be demonstrated throughout operating range. Demonstrate that equipment is not defective electrically, mechanically, or otherwise, and is in a safe and satisfactory operating condition. Check for excessive vibration, leaks in manhole, piping, and seals, electrical power input, and correct operation of control system and equipment.

D Measurement

The department will measure Sewage Ejector Pump and Controls by each unit, acceptably completed.

E Payment

The department will pay for the installation of this item at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.20	Sewage Ejector Pump and Controls	EACH

Payment is full compensation for furnishing and installing all materials associated with the sewage ejector pump including but not limited to pumps, valves, pipe, floats; cable and flow meters; and for testing.

46. Pitless Adapter, Item SPV.0060.21.

A Description

Furnish and install a Pitless Adapter to the 8-inch well casing and pressure test the Pitless Adapter.

B Materials

The following Pitless Adapter, or equal, will be acceptable:

- Maass Midwest, Huntley, IL, Model J Weld-On, Pitless Adapter, 8-Inch;
- Advance-Morrison, Milwaukee, WI, Weld-On Pitless Adapter; or
- Whitewater Manufacturing, Whitewater, WI, Model F Weld-On, Pitless Adapter.

C Construction

Install according to the applicable sections of the current Wisconsin Administrative Code. The pitless adapter shall be tested and proven watertight under a pressure not less than 14 psig for a minimum of 30 minutes according to Wis. Adm. Code, s. NR 812.31(2)(c). The pump installer shall notify the WDNR at least 48 hours before testing so that WDNR may witness the test (See Figure 29 from Wis. Adm. Code).

D Measurement

The department will measure Pitless Adapter by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.21	Pitless Adapter	EACH

Payment is full compensation for furnishing and installing all materials; and testing the adapter.

47. Well Pump, Item SPV.0060.22.

A Description

Furnish and install one submersible water well pump for each well, piping and electrical cable from pump to finished grade, and all the necessary pipes, and attachments for the well.

This installation shall be complete in every detail so as to provide automatic and uninterrupted water service to the building.

B Materials

Pump: The well shall be capable of producing 86 gpm of acceptable water. Furnish a pump that is capable of producing a minimum of 86 gpm, as measured at the pressure tank discharge, against a tank pressure range of 50 to 70 psi.

Furnish pumps manufactured by Franklin Electric, Fort Wayne, Indiana; A.Y. McDonald Mfg. Company, Dubuque, Iowa; Sta-Rite Pump (div. of Pentair), Delevan, Wisconsin; Grundfos USA, Olathe, Kansas; or approved equal.

Provide the pump with a pump cable from the pump unit to finished grade sized to match the electrical conductor feeding the well. Provide electrical conduit at grade and connect to vermin proof well cap. Coordinate installation with electrical contractor.

C Construction

Install according to the applicable sections of the current Wisconsin Administrative Code.

On Rest Area 16, the well pumps shall be located approximately 60-80 feet below grade.

Thoroughly test the entire installation for conformance with all operating and capacity specifications mentioned hereafter.

D Measurement

The department will measure Well Pump by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.22	Well Pump	EACH

Payment is full compensation for furnishing and installing all materials.

48. Sanitary Sewer Manhole, 4-FT, Item SPV.0060.23.

A Description

A.1 General

Construct precast concrete sanitary sewer manhole, including excavating, backfilling, and compacting, in the location shown on the plans or as determined by the engineer.

A.2 Submittals

Submit five copies of shop drawings for the precast concrete manhole.

B Materials

B.1 Manhole

Precast reinforced concrete manhole shall meet the requirements of ASTM C478. Joint shape shall be compatible with designated joint materials. Steps and pipe seal components shall be cast into riser sections. Joints shall have rubber ring or plastic gasket material. Rubber gaskets shall conform to the requirements of ASTM C443. Plastic gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips, conforming to Fed. Spec. SS-S00210, Type I, Rope Form; Ram Nek, Kent Seal No. 2, or equal with precast flowline. Pipe seals shall be flexible, watertight, gasket seals for pipe entrance holes; PressSeal/Press Wedge I or PSX, Scales/Res-Seal, or equal meeting ASTM

C923; Kor-N-Seal or equal. Manhole steps shall be ASTM C478 cast iron or steel-reinforced copolymer polypropylene.

B.2 Castings and Covers

Castings for manhole frame and covers shall be cast iron, ASTM A48, Class 30, of uniform quality, free from cracks or other defects. Type of castings shall be as designated on detail sheets or approved equal. Covers shall have self-sealing neoprene O-ring gaskets and concealed pick holes.

B.3 Stone Bedding

The stone bedding shall conform to the requirements for crushed stone specified under bid item "Forcemain PVC 2-Inch."

C Construction

Construct sanitary sewer manhole of precast reinforced concrete according to details on the plans. Construct drop manholes, where required on the plans, according to the requirements of Section 3.5.8(d)1 of the Standard Specifications for Sewer and Water Construction in Wisconsin. Excavate as necessary to place precast concrete manhole on a firm and level base. Remove all undesirable material, which cannot support the structure below the normal base bottom and replace with stone bedding as directed by the engineer. Join risers, top sections, adjusting rings, and castings using compatible rubber rings or plastic gasket material. When plastic gasket material is used, joining surfaces shall receive manufacturer's approved primer as required. Ensure gasket material forms a tightly packed, watertight seal in annular joint space. Bring manhole frames to existing grade and embed in a mortar course. Trowel-finish the inner face of this mortar joint. Backfill and compact soils around the sanitary sewer manhole to Standard Proctor density specified for adjacent piping.

D Measurement

The department will measure Sanitary Sewer Manhole, 4-FT by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.23	Sanitary Sewer Manhole, 4-FT	EACH

Payment is full compensation for all excavation, backfilling, and compacting; for furnishing and installing all materials, including precast reinforced concrete structure, frame and covers, and stone bedding.

49. Coring Manhole, Item SPV.0060.24.

A Description

Core into existing manhole to allow for connection into the sanitary sewer system.

B (Vacant)

C Construction

Cut through existing manhole with equipment that creates a clean and smooth cut. Fill the annular space between the sanitary sewer pipe and the manhole wall with a flexible seal meeting ASTM C923, Kor-N-Seal or equal, to create a watertight seal. Modify/construct concrete flowline to direct flow from new connection to existing outlet.

D Measurement

The department will measure Coring Manhole by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.24	Coring Manhole	EACH

Payment is full compensation for furnishing all materials; for coring and sealing; for disposing of all excavated and surplus material.

50. Well System Controls, Item SPV.0060.25.

A Description

Furnish and install a control panel and related accessories for an alternating lead/lag system for the two new wells. The control panel and pressure tank shall be located in Room 111 of the rest area building. The system shall monitor water system pressure near the pressure tank in the same room.

B Materials

B.1 Well System Functional Description

The well pumps shall be controlled by a programmable controller activated by a pressure transducer.

The lead well pump shall pump, with varying speed, to maintain a pressure of 50 psi as determined by the transducer that shall monitor the water system pressure.

Well pumps shall be automatically alternated on a daily basis or after a preset run time. Provide a human operator interface to manually operate and alternate pumps.

B.2 Control Panel

Control panel shall have NEMA 1 enclosure and shall be assembled in compliance with Underwriters Laboratories (UL) industrial control panels 508 listing. Panel shall be a rigid, wall mounted panel sized to accommodate the required power, control, and supervisory devices.

The following alarms shall be transmitted to the auto-dialer mounted in Room 115 over #14 wire pairs: Pump Failure — Low Urgency; Low Pressure — High Urgency.

Provide a green pilot light on the control panel for each pump to indicate when the pump is running.

Provide a run time meter for each pump. Meters shall be non-reset-able 0-9,999.9 hours. Provide a pressure gauge or indicator to show water system pressure.

B.3 PLC System

Provide a programmable logic controller (PLC) system in control panel to control well pumps.

The system supplier shall provide all the programming and software necessary to make the system function as specified. The system supplier shall document and annotate the programs, update them as required at start-up, and turn the programs over to the owner in the form of a USB flash drive.

B.4 Pressure Transducer

Provide a submersible pressure transducer connected to water distribution system to sense system pressure.

Transducer shall be suitable for a pressure range of 0-200 psi. Provide all accessories and hardware required to tap water distribution piping and mount transducer.

B.5 Pressure Tank

Provide a pressure tank meeting requirements of Wisconsin Administrative Code NR 812.33, sized for a CONSTANT PRESSURE SYSTEM and meeting the pump manufacturer's specifications including requirements for minimum pump run time. Provide sample tap at pressure tank, piping and fittings for a complete installation.

C Construction

Install well system controls according to manufacturer's recommendations. All work shall comply with the state electrical code. The installation shall be complete in every detail so as to provide automatic and uninterrupted water service to the rest area and maintenance buildings.

D Measurement

The department will measure Well System Controls by each unit, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.25	Well System Controls	EACH

Payment is full compensation for furnishing and installing all materials; and for furnishing all labor.

51. Adjusting Manhole Covers with Rubber Rings, Item SPV.0060.26.

A Description

This special provision describes providing and setting rubber grade rings for manhole covers to final grade, along with adjusting the castings to final grade. Conform to standard spec 611 and as follows.

B Materials

Furnish materials conforming to standard spec 611.

Furnish rubber grade rings from the department's approved list that have a flat and/or tapered configuration of a size that closely matches the inside and outside dimensions of circular or rectangular structures.

Joint sealant shall conform to the rubber grade ring manufacturer recommendations. In lieu of a recommended sealant, a joint sealant, cold-applied, shall conform to ASTM-D-1850 Polyurethane Door, Window and Siding Sealant or PL Premium Polyurethane Concrete and Masonry Sealant or equivalent.

C Construction

Adjust manhole covers conforming to standard spec 611.

Install rubber grade rings individually or in combination not to exceed 4 inches in height and locate at the casting. If more than 4 inches of adjustment is necessary, use one concrete ring, 4 inches or more in height, with rubber rings on top of the concrete ring. Final casting placement shall conform to the finished crown of the road. Where a 4-inch concrete ring is needed, do not shim or mortar the concrete ring in order to meet the desired elevation and/or crown and slope of the proposed roadway. Taper the rubber grade rings to match the slope of the crown and profile of the road. Ensure that the concrete and metal surfaces to receive sealing compound are clean, dry and free of grease or oils. Bond the rubber grade rings to adjacent surfaces by laying a continuous bead 5/16-inch thick joint sealant on the top surface of the concrete of the bottom surface of the grade ring on a diameter 1-inch smaller than the outside diameter of the rubber grade ring. Where more than one grade ring is required, apply a continuous bead of sealant as above. Then apply sealant to the top surface of the grade ring and set the casting firmly in place taking care to properly center it over the structure opening and ensuring a firm contact between the casting and the grade ring. Exercise care in backfilling around grade rings and casting before joint sealant being fully cured.

Use concrete rings of a size that closely matches the inside and outside dimensions of the structures. If more than 4 inches of adjustment is necessary, use one concrete ring 4 inches or more in height with a maximum of one 2-inch concrete ring on top. Tie concrete rings to the structure using a minimum of two No. 4 rebars, spaced on opposite sides of the structure, when the total thickness of concrete rings is 6-inches or greater. Drill the hole for the bar to a depth of 6 inches into the top of the structure and to such a diameter as to provide a secure fit. The bar shall be of adequate length to secure the concrete rings to the structure without protruding out of the top concrete ring.

Compact around each manhole to prevent settling.

D Measurement

The department will measure Adjusting Manhole Covers with Rubber Rings by each manhole adjustment, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.26	Adjusting Manhole Covers with Rubber Rings	EACH

Payment is full compensation for all work hereinafter described and will conform to standard spec 611.

ner-611-010 (20140807)

52. Bollard, Item SPV.0060.27.

A Description

This special provisions describes furnishing and installing bollards at locations as detailed in the plans and as hereinafter provided.

B Materials

Fabricate pipe bollards from schedule 80 galvanized steel pipe.

Provide concrete according to standard spec 501 conforming to Grade A, A-FA, A-S, A-T, A-IS, A-IP, and A-IT.

C Construction

Paint the bollards as specified in standard spec 517.2.4, color red.

Paint the bollards according to standard spec 517.3. For the portion of the bollard that will be fully encased in concrete, apply only the zinc-rich primer as specified in standard spec 517.3.1.7.2.

Excavate to the depth shown on the plans. Remove water or other foreign material from the excavation and inside the pipe before placing concrete. Place concrete in the excavation and inside pipe in a continuous operation at a rate that will not cause air pockets. The concrete may not have cold joints. Fill the pipe completely with concrete and consolidate to a depth of at least 4 feet with a mechanical vibrator or by other engineer-approved method.

Protect the bollards from damage to the paint during transportation, storage, placement and concrete placement. Repair any damaged paint according to standard spec 517.3.

D Measurement

The department will measure Bollard as each individual bollard, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.27	Bollard	EACH

Payment is full compensation for providing pipe, concrete, and paint; for excavation; for placing concrete within the pipe and for the footing; for backfilling and disposing of surplus materials; and for repairs to the paint system.

53. Split Rail Fence, Item SPV.0090.01.

A Description

This item consists of Split Rail Fence. The work shall be according to the applicable plans and the 32 33 00 Site Furnishing specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Split Rail Fence by the linear foot, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT

SPV.0090.01	Split Rail Fence	LF

Payment is full compensation for furnishing all materials and equipment.

54. Pipe Underdrain (8-Inch) with Geotextile Fabric and Aggregate, Item SPV.0090.02.

A Description

This special provision describes providing and placing pipe underdrain, geotextile fabric, and aggregate as shown on the plans and hereinafter provided. The work under this item shall be according to the standard specifications for each component.

B Materials

B.1 Pipe

Provide Pipe Underdrain 8-Inch conforming to the pertinent requirements of standard spec 612.2.

B.2 Geotextile Fabric

Provide Geotextile Fabric Type DF Schedule B conforming to the pertinent requirements of standard spec 645.2.1 and 645.2.2.4.

B.3 Aggregate

Provide coarse aggregate size No. 1 conforming to the pertinent requirements of standard spec 501.2.7.4.

C Construction

Construct the Pipe Underdrain (8-Inch) with Geotextile Fabric and Aggregate as the plans show and conforming to standard spec 612.3.1, 612.3.3, 612.3.5, and 645.3.1.4.

D Measurement

The department will measure Pipe Underdrain (8-Inch) with Geotextile Fabric and Aggregate by the linear foot, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0090.02	Pipe Underdrain (8-Inch) with Geotextile Fabric and Aggregate	LF

Payment is full compensation for providing and placing all materials, including pipe underdrain, geotextile fabric, aggregate, backfill, connections, fittings, and caps or plugs; and for all excavating, recompacting, disposing of surplus material, and restoring the work site.

swr-612-001 (20160205)

55. Forcemain PVC, 2-Inch, Item SPV.0090.03.

A Description

Excavate required trenches, furnish and lay therein forcemain of the size, material, and class specified, furnish and place granular bedding, stone bedding and buttressing when needed, and backfill and compact trenches in the locations shown on the plans or as determined by the engineer.

B Materials

B.1 Forcemain Pipe

The forcemain shall be polyvinyl chloride (PVC) pressure pipe, ASTM 2241 SDR-26 suitable for 160-psi hydrostatic pressure. Joints shall be bell and spigot with rubber rings conforming to ASTM F477. Solvent weld joints will not be allowed.

B.2 Granular Material

Granular material used for bedding of the forcemain pipe shall consist of particles ranging from fine to coarse in a substantially uniform combination. Sufficient fine material shall be present to fill all the voids of the coarse material. No stone over 75-mm sieve size shall be present. Some fine clay or silt particles are desirable but shall not be present in the form of lumps. Granular material shall conform to the grading requirements as follows:

Sieve Size	% Passing by Weight
2”	95-100
No. 4	35-60
No. 200	5-15

B.3 Crushed Stone

Crushed stone when required under sanitary sewer forcemain, shall consist of clean, hard, and angular material crushed from bedrock limestone, dolomite, or granite graded by weight as follows:

Sieve Size	% Passing by Weight
1”	100
¾”	90-100
3/8”	20-60
No. 4	0-10
No. 50	0-5

B.4 Tracer Tape

Provide tracer tape above the installed forcemain throughout the entire route. Detectable warning tape shall have sharply printed "SANITARY SEWER" on a green background. Minimum width of tape shall be 2-inches. Tape shall be detectable to a depth of 1½-inches below grade.

B.5 Insulation

Provide foam insulation board in the locations shown on the drawings. Extruded closed-cell polystyrene, 2-inch thickness, with integral high-density skin complying with ASTM C578, Type VI, minimum 40-psi compressive strength, 0.3% max. water absorption, thermal resistance (R-value at 40 deg. F) of 5.4 per 2-inch thickness. Each location shall receive two 4-foot by 8-foot pieces of 2-inch thick insulation board to protect the forcemain from exposure to air in the culverts.

C Construction

C.1 Installation

The maximum and minimum width of the trench at the top of the pipe shall be the outside diameter of the pipe plus 2 feet and 1 foot, respectively. Assemble and install the forcemain pipe according to the manufacturer's recommendations. Place the bedding materials as shown on the details. Play the material by hand or by an equally careful means; compact by hand or mechanically to 90% of the Standard Proctor density (ASTM D698) for the material used. If the bottom of the trench is of undesirable material, such as organic soil, or the presence of groundwater makes the trench condition unsuitable, then use crushed stone bedding. Deflection of pipe and joints shall not exceed those recommended by the manufacturer. Cast-in-place concrete buttresses for bends 15-degrees or larger shall conform in size to the dimensions shown on the buttress details. Cleanouts shall be of the exact size and type as the forcemain; place in locations as shown on the plans. However, these locations may be adjusted to better suit field conditions and actual pipe position. Backfill the forcemain and machine compact immediately upon laying pipe. Install tracer tape directly over forcemain at a depth of 6 inches to 12 inches below finished grade. Use excavated material for backfill provided that the material, in the judgement of the engineer, is suitable. Organic matter, all types of refuse, or concrete are considered unsuitable. Do not use frozen backfill material. Compact the backfill to the density of surrounding undisturbed soils.

C.2 Testing

Perform pressure and leak tests for each section of forcemain. The contractor shall be responsible for obtaining and disposing of water required for tests. Run the pressure testing at 150% of the design operating pressure as specified by the engineer, but not less than 50-psi. The leakage test may be done concurrently with the pressure test. Leakage allowed shall be 3.25 fl. oz. per 3280 feet for each .04 inches of nominal diameter size of pipe (3 gal per 3280 feet for 6-inch pipe). Test for leakage shall last for one hour and if the test should fail, immediately make the necessary repairs at contractor expense. A two-day notification to the engineer is required prior to conducting these tests. The engineer shall be present at the testing and will record results. Obtain prior approval from the engineer for all testing procedures.

D Measurement

The department will measure Forcemain, PVC, 2-Inch by the linear foot, acceptably completed. The length to be paid shall not include the construction into or through manholes or other structures.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0090.03	Forcemain, PVC, 2-Inch	LF

Payment is full compensation for all excavating, bedding, backfilling, and compacting; for furnishing and placing all materials including granular and stone bedding, fittings, cleanouts, and buttresses; for all testing; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the contract work. Any work involved in forming a satisfactory foundation at depths of 12-inches or less below the bottom of the pipe will be considered incidental and will not be paid for as Extra Work. Any work required at depths greater than 12-inches below the bottom of the pipe will be paid for as Extra Work according to standard spec 109.4.

56. Sanitary Sewer PVC, 4-Inch, Item SPV.0090.04; Sanitary Sewer PVC, 8-Inch, Item SPV.0090.05.

A Description

Furnish and install the sanitary sewer, of the diameter shown, with all fittings, caps, plugs, and granular backfill as shown on the plans and as hereinafter provided. This work begins at the locations shown on the plans.

B Materials

B.1 PVC Pipe

All pipe and fittings shall comply with applicable standards of the Wisconsin Plumbing Code and be of one manufacturer. The sanitary sewer shall be polyvinyl chloride (PVC) sewer pipe conforming to ASTM D3034, SDR-35. Joints shall be elastomeric gasket type meeting the requirements of ASTM D3034. Sanitary wyes and fittings shall be incidental.

B.2 Granular Material

Granular material used for bedding of the sanitary sewer pipe shall consist of particles ranging from fine to coarse in a substantially uniform combination. Sufficient fine material shall be present to fill all the voids of the coarse material. No stone over 75-mm sieve size shall be present. Some fine clay or silt particles are desirable but shall not be present in the form of lumps. Granular material shall conform to the grading requirements as follows:

Sieve Size	% Passing by Weight
2”	95-100
No. 4	35-60
No. 200	5-15

C Construction

Make any changes in grade or direction at manholes or other structures. Placement and depth of bedding shall conform to the details shown on the plans. Bedding shall be compacted by hand or mechanically to 90% of the Standard Proctor density (ASTM D698) for the material used. Prior to backfilling, test each section of sewer according to standard spec 607.3.5 and compact to the density of the surrounding undisturbed soils.

D Measurement

The department will measure Sanitary Sewer, PVC (size) by the linear foot, acceptably completed. The length to be paid shall not include the construction into or through manholes or other structures.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0090.04	Sanitary Sewer PVC, 4-Inch	LF
SPV.0090.05	Sanitary Sewer PVC, 8-Inch	LF

Payment is full compensation for excavating, backfilling, and compacting; for furnishing and placing all materials, including fittings and granular backfill; for connecting to existing piping; and for testing.

Contract unit prices shall apply without adjustment to the quantities of sanitary sewers constructed at elevations not in excess of 12-inches above or below the elevations shown on the plans. Pipe sewers or portions thereof constructed by order of the engineer at elevations in excess of 12-inches above or below the elevations indicated on the plans will be considered and paid for as provided in standard spec 109.4, Extra Work.

Any work involved in forming a satisfactory foundation at depths of 12-inches or less below the bottom of the pipe will be considered incidental and will not be paid for as Extra Work. Any work required at depths greater than 12-inches below the bottom of the pipe will be paid for as Extra Work according to standard spec 109.4.

57. Underground Copper Water Line, 1-Inch, Item SPV.0090.06; Underground Copper Water Line, 3-Inch, Item SPV.0090.07.

A Description

Furnish and install copper water line, of the diameter shown, from within 5 feet of the rest area building to each well, as shown on the plans and as hereinafter provided.

B Materials

Underground pipe shall be new Type K annealed copper tubing conforming to ASTM B88. All fittings shall be flared type for underground use.

C Construction

Excavate trenches to a minimum depth of 7.5 feet, as required to install the copper waterline as indicated on the plans. Install according to the applicable sections of the current Wisconsin Administrative Code. Backfill the copper waterline according to standard spec 607.3.5 except as hereinafter modified. Lay the waterline in a 12-inch envelope of sand backfill, backfill the remainder of the trench with the native excavated material.

D Measurement

The department will measure Underground Copper Water Line, (size) by the linear foot, complete in place from within 5 feet of the rest area building and within 5 feet of the maintenance building, measured along the centerline of the pipe.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0090.06	Underground Copper Water Line, 1-Inch	LF

SPV.0090.07	Underground Copper Water Line, 3-Inch	LF

Payment is full compensation for furnishing and installing the water pipe; for excavation, backfill and properly disposing of surplus materials.

58. Construction Staking Sanitary Sewer System, Item SPV.0090.08.

A Description

Furnish and set construction stakes or control points and make all calculations required that are necessary to establish the horizontal and vertical position of sanitary sewer system (includes sanitary sewer pipe, manholes, cleanouts, air release valves, comminutor, sanitary lift station, valve vault, horizontal deflection, and vertical bends of the sanitary sewer system), as the case may be, according to the plans or as directed by the engineer. The work also includes checking horizontal and vertical position of sanitary sewer structures, sanitary sewer pipe for accuracy with existing field conditions. Immediately notify the engineer of any errors and apparent discrepancies for correction or interpretation prior to proceeding with the work.

B (Vacant)

C Construction

C.1 General

Obtain or calculate from data in the plans all benchmark data, grades, and alignment; verify the data, grades, and alignment with the engineer prior to beginning the work. The engineer will furnish horizontal alignment, horizontal alignment ties, and control point data. This work shall include re-establishing the plan horizontal roadway alignment, alignment ties, and control points. Obtain prior approval of the engineer for methods of survey and staking prior to beginning the work. The degree of accuracy used in the survey work shall be consistent with third order, Class II. Establish additional benchmarks and control points as necessary or as directed by the engineer. Check plan dimensions, alignment, and elevations for accuracy with existing field conditions. Any errors and apparent discrepancies shall be called to the engineer’s attention immediately for correction or interpretation prior to proceeding with the work. Maintain neat, orderly and complete survey notes and computations used in establishing the lines and grades. Make the survey notes and computations available to the engineer within 24 hours upon request as the work progresses.

C.2 Sanitary Sewer System

Set and maintain construction stakes for sanitary sewer system as necessary to achieve the required accuracy and to satisfy the contractors’ method of operations. Locate all sanitary sewer system construction stakes to within 0.02 feet of the true horizontal position and establish the grade elevation to within 0.01 feet of the true vertical position. Place construction stakes for sanitary sewer at every sanitary sewer structure, (manholes, cleanouts, air release valves, comminutor, sanitary lift station, valve vault) and at every horizontal deflection and vertical bend in the sanitary sewer. In addition, place stakes at 50-foot intervals along the sanitary sewer. Determine that sanitary sewer structures, bends and deflections of the sanitary sewer pipe match existing field elevations and provide this information to the engineer 14 calendar days prior to the contractor ordering manholes, cleanouts, air release valves, comminutor, sanitary lift station, valve vault, and sanitary sewer pipe.

D Measurement

The department will measure Construction Staking, Sanitary Sewer System by the linear foot, acceptably completed, along the centerline of the pipe including sanitary sewer structures.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0090.08	Construction Staking, Sanitary Sewer System	LF

Payment is full compensation for performing the survey work necessary to locate and set all manholes, cleanouts, air release valves, comminutor, sanitary lift station, valve vault, and sanitary storm sewer pipe structures, and sanitary sewer pipe for accuracy with existing field conditions; and for resetting damaged or missing sanitary sewer structure and sanitary sewer pipe construction stakes.

59. Unit Paving, Item SPV.0165.01.

A Description

This item consists of Unit Paving. The work shall be according to the applicable plans and the 32 14 13 Unit Paving specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure Unit Paving by the square foot, acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0165.01	Unit Paving	SF

Payment is full compensation for furnishing and installing all materials and equipment.

ADDITIONAL SPECIAL PROVISION 1 (ASP 1)
FOR TRANSPORTATION ALLIANCE FOR NEW SOLUTIONS (TrANS)
PROGRAM EMPLOYMENT PLACEMENTS AND APPRENTICESHIPS

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), Section 5204(e) – Surface Transportation Workforce Development Training and Education, provides for 100 percent Federal funding if the core program funds are used for training, education, or workforce development purposes, including "pipeline" activities. The core programs includes: Congestion Mitigation and Air Quality Improvement (CMAQ) Program, Highway Bridge Program (HBP), Interstate Maintenance (IM), National Highway System (NHS), and Surface Transportation Program (STP). These workforce development activities cover surface transportation workers, including OJT/SS programs for women and minorities as authorized in 23 U.S.C. §140(b).

TrANS is an employment program originally established in 1995 in Southeastern Wisconsin. Currently TrANS has expanded to include TrANS program locations to serve contractors in Southeast (Milwaukee and surrounding counties), Southcentral (Dane County and surrounding counties including Rock County), and most Northeastern Wisconsin counties from locations in Keshena, Rhinelander and surrounding far Northern areas. TrANS attempts to meet contractor's needs in other geographic locations as possible. It is an industry driven plan of services to address the outreach, preparation, placement and retention of women, minorities and non-minorities as laborers and apprentices in the highway skilled trades. These candidate preparation and contractor coordination services are provided by community based organizations. For a list of the TrANS Coordinators contact the Disadvantaged Business Enterprise Office at (414) 438-4583 in Milwaukee or (608) 266-6961 in Madison. These services are provided to you at no cost.

I. BASIC CONCEPTS

Training reimbursements to employing contractors for new placements, rehires or promotions to apprentice of TrANS Program graduates will be made as follows:

1) **On-the-Job Training, Item ASP.1T0G, ASP 1 Graduate.** At the rate of $5.00 per hour on federal aid projects when TrANS graduates are initially hired, or seasonally rehired, as unskilled laborers or the equivalent.

   Eligibility and Duration: To the employing contractor, for up to 2000 hours from the point of initial hire as a TrANS program placement.

   Contract Goal: To maintain the intent of the Equal Employment Opportunity program, it is a goal that __5___ *(number)* TrANS Graduate(s) be utilized on this contract.

2) **On-the-Job Training, Item ASP.1T0A, ASP 1 Apprentice.** At the rate of $5.00 per hour on federal aid projects at the point when an employee who came out of the TrANS Program is subsequently entered into an apprenticeship contract in an underutilized skilled trade (this will include the Skilled Laborer Apprenticeship when that standard is implemented).

   Eligibility and Duration: To the employing contractor, for the length of time the TrANS graduate is in apprentice status.

   Contract Goal: To maintain the intent of the Equal Employment Opportunity program, it is a goal that __8___ *(number)* TrANS Apprentice(s) be utilized on this contract.

3) The maximum duration of reimbursement is two years as a TrANS graduate plus time in apprentice status.

4) If a TrANS program is not available in the contractor's area and another training program is utilized, payment of On-the-Job Training hours may be approved by the Wisconsin Department of Transportation (WisDOT) if the training program meets the established acceptance criteria. Only On-the-Job Training Hours accumulated after WisDOT approval will be reimbursed as specified under Items ASP.1T0G and ASP.1T0A. For more information, contact the Disadvantaged Business Enterprise Office at the phone numbers listed above.

5) WisDOT reserves the right to deny payments under items ASP.1T0G and ASP.1T0A if the contractor either fails to provide training or there is evidence of a lack of good faith in meeting the requirements of this training special provision.

II. RATIONALE AND SPECIAL NOTE

The $5.00 per hour now being paid for TrANS placements is intended to cover the duration of two years to allow for reaching entry-level laborer status. An additional incentive, the $5.00 rate, would promote movement into the underutilized skilled trades' apprenticeships and applies until the individual completes their apprenticeship. These incentives benefit TrANS candidates by giving them a better opportunity to enter a skilled trade; benefits contractors who will be assisted in meeting their EEO profiles and goals; and benefits the public who will see the program reinforce larger public-private employment reform in Wisconsin. The pool of TrANS graduates was created for the purpose of addressing underutilization in the skilled trades, an objective that is further reinforced by a parallel retention pilot program, known as the Companywide Reporting. *Whether or not reimbursement is involved, the WisDOT reassures contractors who are in the Companywide Program that TrANS placements still contribute toward fulfilling the new hire goal of 50% women and minorities.* Based on data administered by United States Department of Labor (US DOL), the highway skilled trades remain underutilized for women statewide (less than 6.9%); and for minorities in all counties (% varies by county).

NOTE: *Unless using other advancement strategies, contractors are encouraged to use some or all of this monetary incentive to offset the cut in hourly wages an individual may incur when entering an apprenticeship if the full general laborer hourly rate has been previously paid. No special accounting measures are required.*

III. IMPLEMENTATION

The implementation of ASP 1 is intended to cover only the amount of time it takes for underutilization to be resolved across the trades. This will be measured annually at the county and/or state levels using data administered by WisDWD in relation to goals set by the USDOL-OFCCP. With appropriate state and federal approvals, we may also do some measurement at the company level.

It is the contractor's responsibility to note on their Certified Payrolls if their employee is a TrANS graduate or a TrANS apprentice. The District EEO Coordinators utilize the information on the Certified Payrolls to track the hours accumulated by TrANS Graduates and TrANS apprentices on WisDOT contracts. Payment under this ASP 1 is made based on the hours recorded off of the Certified Payrolls. Tracking may eventually include improved linkages with the WisDWD apprentice database, information from company and committee level sources.

TrANS is nondiscriminatory by regulation, and is a tool for optional use by contractors to address the underutilization of women and minorities as laborers and apprentices in our industry's skilled trades.

IV. TRANS TRAINING

As part of the contractor's equal employment opportunity affirmative action program, training shall be provided to employees enrolled in apprenticeship and on-the-job training programs as follows:

The contractor shall provide on-the-job training aimed at developing full journey workers in the type of trade or job classifications involved. In the event the contractor subcontracts a portion of the contract work, the contractor shall determine how many, if any, of the trainees are to be trained by the subcontractor provided, however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this training special provision is made applicable to such subcontract.

Training and upgrading of minorities and women toward journey workers status is a primary objective of this training special provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority trainees and women trainees); to the extent such persons are available within a reasonable area of recruitment. The contractor will be given an opportunity and will be responsible for demonstrating the steps that they have taken in pursuance thereof, prior to determination as to whether the contractor is in compliance with this training special provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journey workers status or in which they have been employed as a journey worker. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the contractor's records should document the findings in each case.

V. APPRENTICESHIP TRAINING

The Federal Highway Administration's (FHWA) policy is to require full use of all available training and skill improvement opportunities to assure increased participation of minority groups,

disadvantaged persons and women in all phases of the highway construction industry. The FHWA On-the-Job Training (OJT) Program requires the State transportation agencies (STAs) to establish apprenticeships and training programs targeted to move women, minorities, and disadvantaged individuals into journey-level positions to ensure that a competent workforce is available to meet highway construction hiring needs, and to address the historical under-representation of members of these groups in highway construction skilled crafts.

The OJT Supportive Services (OJT/SS) Program was established in Title 23 Code of Federal

Regulations (CFR), Part 230) to supplement the OJT program and support STA training programs by providing services to highway construction contractors and assistance to highway construction apprentices and trainees. The primary objectives of OJT/SS are:

(1) To increase the overall effectiveness of the State highway agencies' approved training programs.

(2) To seek other ways to increase the training opportunities for women, minorities, and disadvantaged individuals.

The STAs are responsible for establishing procedures, subject to the availability of Surface Transportation and Bridge Funds under 23 U.S.C. §140(b*)* (Nondiscrimination), for the provision of supportive services with respect to training programs approved under 23 CFR, Part 230(a*)* (Equal Employment Opportunity on Federal and Federal-aid Construction Contracts – including Supportive Services).

The contractor and subcontractor shall maintain records to demonstrate compliance with these apprenticeship requirements. Reasonable exemptions and modifications to and from any or all of these requirements will be determined by the Wisconsin Department of Transportation-Civil Rights Office. A request for an exemption or modification, with justification, shall be made in writing, addressed to WisDOT Civil Rights Office, 4802 Sheboygan Avenue, P.O. Box 7965, Rm. 451, Madison, WI 53707.

ADDITIONAL SPECIAL PROVISION 3

DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM IMPLEMENTATION

Authority

Wisconsin Department of Transportation (WisDOT) is a recipient of funds from the US Department of Transportation's Federal Highway Administration. The DBE program is a federal program applicable on all contracts administered by WisDOT that include federal-aid highway funds. The authority for the DBE program is the Transportation Bill as approved by Congress periodically. DBE program guidance and requirements are outlined in the Code of Federal Regulations at 49 CFR Part 26. This contract is subject to DBE provisions because it is financed with federal-aid-highway funds. Additionally, this contract is subject to the *State of Wisconsin Standard Specifications for Highway and Structure Construction* and all applicable contract documents.

Requirements

Pursuant to the federal DBE program regulation at 49 CFR Part 26, a contractor's failure to comply with any provision of the DBE program regulatory provisions will be considered a material breach of contract. This is nonnegotiable.

If a contractor fails to carry out the DBE program requirements and/or the Required Contract Provisions for Federal Aid Contracts (FHWA 1273) referenced in this document, sanctions will be assessed depending upon the facts, reasoning, severity, and remedial efforts of the contractor that may include: termination of contract, withholding payment, assessment of monetary sanctions, and/or suspension/debarment proceedings that could result in the disqualification of the contractor from bidding for a designated period of time.

(1) The Commitment to Subcontract to DBE (Form DT1506 or digital submittal), Attachments A, and Good Faith Effort Documentation (Form DT1202) will be submitted as described in Section 2.
(2) Any change to DBE Commitments thereafter must follow modification of DBE subcontracting commitment as described in Section 9.
(3) The Department requires this list of DBE subcontractors from all bidders at time of bid to ensure the lowest possible cost to taxpayers and fairness to other bidders and subcontractors. Bid shopping is prohibited.
(4) The contractor must utilize the specific DBE firms listed in the approved DBE Commitment to perform the work and/or supply the materials for which the DBE firm is listed unless the contractor obtains written consent in advance from WisDOT. The contractor will not be entitled to payment for any work or materials on the approved DBE Commitment that is not performed or supplied by the listed DBE without WisDOT's written consent.

Description

The Wisconsin Department of Transportation is committed to the compliant administration of the DBE Program. The DBE provisions work in tandem with FHWA 1273 and WisDOT's *Standard Specifications for Highway and Structure Construction* and *Construction and Materials Manual*. The WisDOT Secretary is signatory to assurances of department-wide compliance.

The Department assigns the contract DBE goal as a percentage of work items that could be performed by certified DBE firms on the contract. The assigned DBE goal is expressed on the bid proposal as a percentage applicable to the total contract bid amount.

(1) WisDOT identifies the assigned DBE goal in its contract advertisements and posts the contract DBE goal on the cover of the bidding proposal. The contractor can meet the assigned contract DBE goal by subcontracting work to a DBE firm or by procuring services or materials from a DBE firm.

(2) Under the contract, the prime contractor should inform, advise, and develop participating DBE firms to be more knowledgeable contractors who are prepared to successfully complete their contractual agreement through the proactive provision of assistance in the following areas:

- Produce accurate and complete quotes
- Understand highway plans applicable to their work
- Understand specifications and contract requirements applicable to their work
- Understand contracting reporting requirements

(3) The Department encourages contractors to assist DBE subcontractors more formally by participating in WisDOT's Business Development program as a mentor, coach, or resource. For comprehensive information on the Disadvantaged Business Enterprise Program, visit the Department's Civil Rights and Compliance Section website at: http://wisconsindot.gov/Pages/doing-bus/civil-rights/dbe/default.aspx

1. Definitions

Interpret these terms, used throughout this additional special provision, as follows:

a. **Assigned DBE Contract Goal:** The percentage shown on the cover of the Highway Work Proposal that represents the feasible level of DBE participation for each contract. The goal is calculated using the Engineer's Estimate and DBE Interest Report. Goal assignment includes review of FHWA funds, analyzes bid items for subcontract opportunity and compatibility with DBE certified firm work codes. Additional factors considered include proximity, proportion, and regulations.

b. **Bid Shopping:** In construction law, bid shopping is the practice of divulging a subcontractor's bid to another prospective contractor(s) before or after the award of a contract to secure a lower bid.

c. **DBE:** Disadvantaged Business Enterprise – A for-profit small business concern where socially and economically disadvantaged individuals own at least a 51% interest and control management and daily business operations.

d. **DBE Commitment:** The DBE Commitment is identified in the Commitment to Subcontract to DBE (Form DT1506) and is expressed as the amount of DBE participation the prime contractor has secured. The DT1506, a contract document completed by the bidder, is required to be considered a responsive bidder on an FHWA-funded contract that has an assigned DBE goal. The prime contractor will have the option to submit the DT1506 digitally, as an entry with the bid in Bid Express, or as an attachment to the bid.

e. **DBE Utilization:** The actual participation of a DBE subcontractor on a project. WisDOT verifies DBE utilization through review of the DBE Commitment, payments to subcontractors, and contract documentation. The Prime Contractor receives DBE credit for payments made to the DBE firms performing the work listed on the approved DBE Commitment, and those submitted after approved commitment with Attachment A.

f. **Good Faith Effort:** Legal term describing a diligent and honest effort taken by a reasonable person under the same set of facts or circumstances. For DBE subcontracting, the bidder must show that it took all necessary and reasonable steps to achieve the assigned DBE goal by the scope, intensity, and appropriateness of effort that could reasonably be expected for a contractor to obtain sufficient DBE participation.

g. **Manufacturer:** A firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract.

h. **Reasonable Price:** Contractors are expected to assess reasonable price by analyzing the contract scope for DBE subcontract feasibility and comparing common line items in DBE and non-DBE subcontract quotes for the same work. Per federal regulation, reasonable price is not necessarily the lowest price.

i. **Supplier:** A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles, or equipment required under the contract are bought, kept in stock, and regularly sold or leased to the public.

j. **Tied quote:** Subcontractor quote that groups multiple bid/line items at a bundled/package price with a notation that the items within the quote will not be separated.

2. WisDOT DBE Program Compliance

a. Documentation Submittal

- The Commitment to Subcontract to DBE (Form DT1506 or digital submittal) must be submitted at the time of bid (Tuesday) by all prime contractors.
- Attachments A OR quotes from all DBEs included in the Commitment must be submitted at bid (Tuesday) **OR**
- Within one-hour following bid submittal by ALL prime contractors via eSubmit (Tuesday).
- If only DBE quotes were submitted, all remaining signed Attachments A must be submitted within 24-hours of bid closing via eSubmit (Wednesday).
- If the assigned DBE contract goal is not met, Documentation of Good Faith Effort (Form DT1202) and supporting documentation must be submitted within 24-hours of bid closing (Wednesday) via eSubmit. Instructions for eSubmit.

**Bidders have the option of submitting the DBE Commitment at the time of bid via direct entry through Bid Express OR with attachment of Form DT1506 (Commitment to Subcontract to DBE). The DBE Commitment entered with bid is the digital form of the DT1506. Separate submission of Form DT1506 is not required if the DBE Commitment is entered in Bid Express. Form DT1202, if applicable, is no longer required to be submitted at time of bid; submit DT1202 within the 24-hour supplemental time frame following bid closing.

The DBE Office will not certify Good Faith Effort and the Bureau of Project Development will consider the bid nonresponsive if the contractor fails to furnish the DBE Commitment (digitally entered into the bid OR Form DT1506 as an attachment), Attachments A, and Form DT1202 if applicable, as required. See sample forms in the Appendix.

b. Verification of DBE Commitment

The documentation related to DBE subcontract commitment submitted prior to contract award is evaluated as follows:

(1) DBE Goal Met

If the bidder indicates that the contract DBE goal is met, the Department will evaluate the DBE Commitment submitted with bid OR Form DT1506, and Attachments A to verify the actual DBE percentage calculation. If the DBE Commitment is verified, the contract is eligible for award with respect to the DBE Commitment.

(2) DBE Goal Not Met

a) If the bidder indicates a bid percentage on the DBE Commitment that does not meet the assigned DBE contract goal, the bidder must request alternative evaluation of good faith effort through submission of Form DT1202 (Documentation of Good Faith Effort) within 24-hours of bid including narrative description. Supplementary documentation of good faith effort that supports the DT1202 submission is also due within 24-hours of bid submission and prior to bid posting. The Department will review the bidder's DBE Commitment and evaluate the bidder's good faith efforts submission.

b) Following evaluation of the bidder's Good Faith Effort documentation the bidder will be notified that the Department intends to:

1. *Approve* the request (adequate documentation of GFE has been submitted) - no conditions placed on the contract with respect to the DBE Commitment;
2. *Deny* the request (inadequate documentation of GFE has been submitted) - the contract is viewed as non-responsive per Wisconsin Standard Specifications for Highway and Structure Construction and will not be executed.

c) If the Department denies the bidder's request, the contract is ineligible for award. The Department will provide a written explanation for denying the request to the bidder. The bidder may appeal the Department's denial (see Section 4).

Supplemental good faith effort documentation must be submitted through eSubmit.

3. Department's Criteria for Good Faith Effort Documentation

The Federal-aid Construction Contract Provision, referenced as FHWA-1273, explicitly states that the prime contractor shall be responsible for all work performed on the contract by piecework, station work, or subcontract.

The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of the contract including assurances of equal employment opportunity laws, DBE regulations, and affirmative action. Compliance encompasses responsible and responsive action, documentation, and good faith effort.

Contractually, all contractors, subcontractors, and service providers on the contract are bound by FHWA 1273 and DBE program provisions. **Prime contractors should encourage subcontractors to utilize DBE firms whenever possible to contribute to the assigned DBE contract goal.**

Bidders are required to document good faith effort. Per 49 CFR Part 26.53, good faith effort is demonstrated in one of two ways. The bidder:

(1) Documents that it has obtained enough DBE participation to meet the goal; OR

(2) Documents that it made adequate good faith efforts to meet the goal, even though it did not succeed

Appendix A of 49 CFR Part 26 provides guidance concerning good faith efforts. WisDOT evaluates good faith effort on a contract basis just as each contract award is evaluated individually.

The efforts employed by the bidder should be those that WisDOT can reasonably expect a bidder to take to actively and aggressively obtain DBE participation sufficient to meet the DBE contract goal. The Department will only approve demonstration of good faith effort if the bidder documents the quality, quantity, and intensity of the variety of activities undertaken that are commensurate with expected efforts to meet the stated goal.

The Department, in conjunction with industry stakeholders, has developed the following guidance for contractor good faith effort activity. The guidance and the attached appendices provide a framework for the actions required by all parties in the processing and evaluation of bidder's total efforts to achieve the project specific DBE goal prior to the bid letting date.

a. Solicitation Guidance for Prime Contractors:

(1) Document all efforts and decisions made toward achieving the DBE goal on the contract. The bidder should use WisDOT-approved DBE outreach tools, including the UCP DBE Directory and the Bid Express Small Business Network to foster DBE participation on all applicable contracts.

(2) As needed, request assistance with DBE outreach and follow-up by contacting the Department's DBE Support Services Office by phone or email request at least 14 days prior to the bid letting date. Phone numbers are (414) 438-4584 and/or (608) 267-3849; Fax: (414) 438-5392; E-mail: DBE_Alert@dot.wi.gov

(3) Participate in and document a substantive conversation with at least one DBE firm per Let, to discuss questions, concerns, and any other contract related matters that may be applicable to the DBE firm. Guidelines for this conversation are provided in Appendix A of ASP-3.

(4) Request quotes by identifying potential items to subcontract and solicit. In their initial contacts, contractors are strongly encouraged to include a single page, detailed list of items for which they are accepting quotes, by project, within a letting. *See attached sample entitled "Sample Contractor Solicitation Letter" in* Appendix B. Prime contractors should also indicate a willingness to accept quotes in areas they are planning to perform themselves, as required by federal rules. In some cases, it might be appropriate to use DBE firms to do work in a prime contractor's area of specialization.

i. Solicit quotes from certified DBE firms who match possible items to subcontract using all reasonable and available means. Additionally, forward copies of solicitations highlighting the work areas for which quotes are being sought to DBE_Alert@dot.wi.gov

ii. Acceptable outreach tools include SBN (Small Business Network, see Appendix C): https://www.bidx.com/wi/main, postal mail, email, fax, and phone.

a. Contractors must ask DBE firms for a response in their solicitations. See *Sample Contractor Solicitation Letter,* Appendix B. This letter may be included as an attachment to the sub-quote request.

b. Solicit quotes at least 10 calendar days prior to the letting date to allow DBE firms sufficient time to respond. Prime contractors should contact DBE firms early, asking if they need help organizing their quote, assistance confirming equipment needs, or other assistance supporting their submission of a competitive quote for their services.

c. A follow up solicitation should take place within 5 calendar days of the letting date. Email and/or SBN are the preferred method for the solicitation.

iii. Upon request, provide interested DBE firms with adequate information about plans, specifications, and the requirements of the contract by letter, information session, email, phone call, and/or referral.

iv. When potential exists, the contractor should advise interested DBE firms on how to obtain bonding, line of credit, or insurance if requested.

v. Document DBE firm's interest in quoting by taking appropriate steps to follow up initial solicitation with:

a. Email to all prospective DBE firms in relevant work areas

b. Phone call log to DBE firms who express interest via written response or call

c. Fax/letter confirmation

d. Signed copy of record of subcontractor outreach effort

b. Guidance for Evaluating DBE quotes

(1) Quote evaluation practices required to evaluate DBE quotes:

i. Reasonable Price**:** Contractors are expected to assess reasonable price by analyzing the contract scope for DBE subcontract feasibility and comparing common line items in DBE and non-DBE subcontract quotes for the same work. Per federal regulation, reasonable price is not necessarily the lowest price. See 49 CFR Part 26, Appendix A. IV.D(2).

(2) Documentation submitted by the prime of the following evaluation is required to evaluate DBE quotes by contractors:

i. Evaluation of DBE firm's ability to perform "possible items to subcontract" using legitimate reasons, including but not limited to, ***a discussion*** between the prime and DBE firm regarding its capabilities prior to the bid letting. If lack of capacity is the reason for not utilizing the DBE firm's quote, the prime is required to contact the DBE by phone and email regarding their ability to perform the work indicated in the UCP directory listed as their work area by NAICS code. Only the work area indicated by the NAICS code(s) listed in the UCP directory can be counted toward DBE credit. Documentation of the conversation is required.

a In striving to meet an assigned DBE contract goal, contractors are expected to use DBE quotes that are responsive and reasonable. This includes DBE quotes that are not the low quote.

b Additional evaluation - Evaluation of DBE quotes with tied bid items. Typically, this type of quoting represents a cost saving but is not clearly stated as a discount. Tied quotes are usually presented as an 'all or none' quote. When non-DBE subcontractors submit tied bid items in their quotes, the DBE firm's quote may not appear competitive. In such a case, the following steps are taken in comparing the relevant quotes. These are qualitative examples:

i Compare bid items common to both quotes, noting the reasonableness in the price comparison.

ii Review quotes from other firms for the bid items not quoted by the DBE firm to see if combining both can provide the same competitive advantage that the tied bid items offered.

See Appendix D – *Good Faith Effort Evaluation Measures* and Appendix E - *Good Faith Effort Best Practices.*

c. Requesting Good Faith Effort Evaluation At the time of bid- if the DBE goal is not met in full, the prime contractor must indicate they will file form DT1202- Documentation of Good Faith Effort within 24-hours of bid submission. Supplementary documentation of good faith effort that supports the DT1202 submission is also due within 24-hours of bid submission and prior to bid posting. Supporting documentation for the DT1202 is to include the following:

(1) Solicitation Documentation: The names, addresses, email addresses, and telephone numbers of DBE firms contacted along with the dates of both initial and follow-up contact; electronic copies of all written solicitations to DBE firms. A printed copy of SBN solicitation is acceptable.

(2) Selected Work Items Documentation: Identify economically feasible work units to be performed by DBEs to include activities such as: list of work items to be performed; breaking up of large work items into smaller tasks or quantities; flexible time frames for performance and delivery schedules.

(3) Documentation of Project Information provided to interested DBEs: A description of information provided to the DBE firms regarding the plans, specifications, and estimated quantities for portions of the work to be performed by that DBE firm.

(4) Documentation of Negotiation with Interested DBEs: Provide sufficient evidence to demonstrate that good faith negotiations took place. Merely sending out solicitations requesting bids from DBEs does not constitute sufficient good faith efforts.

(5) Documentation of Sound Reasoning for Rejecting DBEs and copies of each quote received from a DBE firm and, if rejected, copies of quotes from non-DBEs for same items.

(6) Documentation of Assistance to Interested DBEs- Bonding, Credit, Insurance, Equipment, Supplies/Materials

(7) Documentation of outreach to Minority, Women, and Community Organizations and other DBE Business Development Support: Contact organizations and agencies for assistance in contacting, recruiting, and providing support to DBE subcontractors, suppliers, manufacturers, and truckers at least 14 days before bid opening. Participate in or host activities such as networking events, mentor-protégé programs, small business development workshops, and others consistent with DBE support.

If the Good Faith Effort documentation is deemed adequate, the request will be approved and the DBE office will promptly notify the Prime Contractor and Bureau of Project Development.

If the DBE Office denies the request, the Prime Contractor will receive written correspondence outlining the reasons. The Department encourages the Prime Contractor to communicate with DBE staff to clarify any questions related to meeting goals and/or contractor demonstration of good faith efforts.

If the contract is awarded, the Prime Contractor must obtain written consent from the DBE Office to change or replace any DBE firm listed on the approved DBE Commitment. No contractor, prime or subsequent tier, shall be paid for completing work assigned to a DBE subcontractor on an approved DBE Commitment unless WisDOT has granted permission for the reduction, replacement, or termination of the assigned DBE in writing. If a prime contractor or a subcontractor on any tier uses its own forces to perform work assigned to a DBE on an approved DBE Commitment, **they will not be paid for the work**. Any changes to DBE Commitment after the approval of the DBE Commitment must be reviewed and approved by the DBE Office prior to the change (see Section 9).

Additional resources for demonstrating and tracking good faith effort can be found on the “Contracting with a DBE” webpage in the ASP-3 and Good Faith Effort Guidance section.

4. Bidder's Documentation of Good Faith Effort Evaluation Request Appeal Process

A bidder can appeal the Department's decision to deny the bidder's demonstration of Good Faith Effort through Administrative Reconsideration. The bidder must provide a written justification refuting the specific reasons for denial as stated in the Department's denial notice. The bidder may meet in person with the Department if so requested. Failure to appeal within 5 business days after receiving the Department's written notice denying the request constitutes a forfeiture of the bidder's right of appeal. Receipt of appeal is confirmed by email date stamp or certified mail signed by WisDOT staff. A contract will not be executed without documentation that the DBE provisions have been fulfilled.

The Department will appoint a representative who did not participate in the original good faith effort determination, to assess the bidder's appeal. The Department will issue a written decision within 5 business days after the bidder presents all written and oral information. In that written decision, the Department will explain the basis for finding that the bidder did or did not demonstrate an adequate good faith effort to meet the contract DBE goal. The Department's decision is final.

5. Determining DBE Eligibility

Directory of DBE firms

a. The only resource for DBE firms certified in the State of Wisconsin is the Wisconsin Unified Certification Program (UCP) DBE Directory. WisDOT maintains a current list of certified DBE firms at: http://wisconsindot.gov/Documents/doing-bus/civil-rights/dbe/dbe-ucp-directory.xlsx

b. The DBE Program office is available to assist with contracting DBE firms:(608) 267-3849.

c. DBE firms are certified based on various factors including the federal standards from the Small Business Administration that assigns a North American Industrial Classification (NAICS) Codes. DBE firms are only eligible for credit when performing work in their assigned NAICS code(s). If a DBE subcontractor performs work that is not with its assigned NAICS code, the prime contractor should contact the DBE Office to inquire about compatibility with the Business Development Program.

6. Counting DBE Participation

Assessing DBE Work

The Department will only count the DBE usage towards the contract DBE goal if the DBE firm is certified as a DBE by one of the UCP agencies. The Department only counts the value of the work a DBE actually performs towards the DBE goal. The Department assesses the DBE work as follows:

a. The Department counts work performed by the DBE firm's own resources. The Department includes the cost of materials and supplies the DBE firm obtains for the work. The Department also includes the cost of equipment the DBE firm leases for the work. The Department will not include the cost of materials, supplies, or equipment the DBE firm purchases or leases from the prime contractor or its affiliate, with the exception of non-project specific leases the DBE has in place before the work is advertised.

b. The Department counts fees and commissions the DBE subcontractor charges for providing bona fide professional, technical, consultant, or managerial services. The Department also counts fees and commissions the DBE charges for providing bonds or insurance. The Department will only count costs the program engineer deems reasonable based on experience or prevailing market rates.

c. If a DBE firm subcontracts work, the Department counts the value of the work subcontracted to a DBE subcontractor.

d. The contractor will maintain records and may be required to furnish periodic reports documenting its performance under this item.

e. It is the Prime Contractor's responsibility to determine whether the work that is committed and/or contracted to a DBE firm can be counted for DBE credit by referencing the work type and NAICS code listed for the DBE firm on the Wisconsin UCP DBE Directory.

f. It is the Prime Contractor's responsibility to assess the DBE firm's ability to perform the work for which it is committing/contracting the DBE to do. Note that the Department encourages the Prime Contractor to assist and develop DBE firms to become fully knowledgeable contractors to successfully perform on its contracts.

g. The Prime Contractor will inform the DBE office via email of all DBE subcontractors added to the project following execution of the contract. The Prime Contractor may omit submission of another form DT1506, but must submit signed Attachment A forms for additional DBE firms.

h. See Section 7 for DBE credit evaluation for Trucking and Section 8 for DBE credit evaluation for Manufacturers, Suppliers, and Brokers

Naming conventions: When emailing files, please use the following language to identify your submission- "Project #, Proposal #, Let date, Business Name, Attachment A" Email: DBE_Alert@dot.wi.gov

*Note: A sublet request is required for DBE work, regardless of subcontract tier, and also for reporting materials or supplies furnished by a DBE.

- Sublet Requests via form DT1925 or WS1925 are required for 1st Tier DBEs
- For all 2nd Tier and below notification of DBE sublet is indicated by the contractor entering them in CRCS

7. Credit Evaluation for Trucking

All bidders are expected to adhere to the Department's current trucking policy posted on the HCCI website at: http://wisconsindot.gov/Documents/doing-bus/civil-rights/dbe/trucking-utilization-policy.pdf

The prime contractor is responsible for ensuring that all subcontractors including trucking firms, receive Form FHWA 1273: https://www.fhwa.dot.gov/programadmin/contracts/1273/1273.pdf

See Section 8 for Broker credit.

8. Credit Evaluation for Manufacturers, Suppliers, Brokers

The Department will calculate the amount of DBE credit awarded to a prime using a DBE firm for the provisions of materials and supplies on a contract-by-contract basis. The Department will count the material and supplies that a DBE firm provides under the contract for DBE credit based on whether the DBE firm is a manufacturer, supplier, or broker. Generally, DBE credit is determined through evaluation of the DBE owner's role, responsibility, and contribution to the transaction. Maximum DBE credit is awarded when the DBE firm manufactures materials or supplies. DBE credit decreases when the DBE firm solely supplies materials, and minimal credit is allotted when the DBE firm's role is administrative or transactional. It is the bidder's responsibility to confirm that the DBE firm is considered a supplier or a manufacturer before listing them on Commitment to Subcontract to DBE form DT1506 or DBE Commitment submitted with the bid.

a. Manufacturers

(1) A manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.

(2) If the materials or supplies are obtained from a DBE manufacturer, **100%** percent of the cost of the materials or supplies counts toward DBE goals.

b. Regular Dealers of Material and/or Supplies

(1) A regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications

and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

(2) If the materials or supplies are purchased from a DBE regular dealer, count **60%** percent of the cost of the materials or supplies toward DBE goals.

(3) At a minimum, a regular dealer must meet the following criteria to be counted for DBE credit:

i. The DBE firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question.

ii. The DBE firm must both own and operate distribution equipment for the product--bulk items such as petroleum products, steel, cement, gravel, stone, or asphalt. If some of the distribution equipment is leased, the lease agreement must accompany the DBE Commitment form for evaluation of the dealer's control before the DBE office approves the DBE credit.

(4) When DBE suppliers are contracted, additional documentation must accompany the DBE Commitment and Attachment A forms. An invoice or bill-of-sale that includes names of the bidder and the DBE supplier, along with documentation of the calculations used as the basis for the purchase agreement, subcontract, or invoice. WisDOT recognizes that the amount on the Attachment A form may be more or less than the amount on the invoice per b.(1) above.

i. The bidder should respond to the following questions and include with submission of form DT1506 or the DBE Commitment entered with bid:

a. What is the product or material?

b. Is this item in the prime's inventory or was the item purchased when contract was awarded?

c. Which contract line items were referenced to develop this quote?

d. What is the amount of material or product used on the project?

(5) Supplies purchased in **bulk** from DBE firms at the beginning of the season may be credited to current contracts if submitted with appropriate documentation to the DBE office.

i. To ensure that the appropriate credit is assigned, follow the procedure below:

a. When DBE suppliers are contracted for bulk supply or commodity purchases, an invoice or bill-of-sale that includes names of the contractor and the DBE supplier should be submitted to the DBE Office via eSubmit (preferred during letting) or the DBE_Alert email box. The supply/commodity credit may be applied during the federal fiscal year (October- September) in which the purchase was made.

b. When the contractor intends to apply the credit to a particular project, submit a copy of the original invoice, documentation of the calculations for supplies/commodities to be used on the project, and an Attachment A. Indicate on the Attachment A:

c. This supply/commodity is in the prime's inventory or pre-paid in case of commodities

d. The full value of the original invoice submitted to the DBE Office, above in (1)

e. The amount of material or product used on this project

f. Fuel estimate listed on Attachment A will be recorded as a deduction from the full fuel purchase amount shown on the invoice

ii. DBE Office Process (Applies only to bulk purchases)

a. Supply/Commodity commitment is received

b. Engineer verifies amount listed on invoice and enters the full amount into spreadsheet

c. The amount of credit applied for each project is updated on the spreadsheet until the bulk purchase is exhausted

d. Engineer informs contractor when full amount of bulk purchase has been applied

c. Brokers, Transaction Expediters, Packagers, Manufacturers' Representatives

(1) No portion of the cost of the materials, supplies, services themselves will count for DBE credit. However, WisDOT will evaluate the fees or commissions charged when a prime purchases materials, supplies, or services from a DBE certified firm which is neither a manufacturer nor a regular dealer, namely: brokers, packagers, manufacturers' representatives, or other persons who arrange or expedite transactions.

(2) Brokerage fees are calculated as **10%** of the purchase amount.

(3) WisDOT may count the amount of fees or commissions charged for assistance in the procurement of the materials and supplies, fees, or transportation charges for the delivery of materials or supplies required on a job site.

(4) Evaluation of DBE credit includes review of the contract need for the item/service, the sub-contract or invoice for the item/service, and a comparison of the fees customarily allowed for similar services to determine whether they are reasonable.

9. DBE Commitment Modification Policy (Formerly "DBE Replacement Policy")

a. Issuing a Contract Change Order

Any changes or modifications to the contract once executed are considered contract modifications and as such require a change order. In addition, the DBE office must provide consent for reduction, termination, or replacement of subcontractors approved on the DBE Commitment *in advance* of the modification for the prime contractor to receive payment for work or supplies. Additions to the DBE Commitment do not require advance notification of the DBE office. (see below e. DBE Utilization beyond the approved DBE Commitment)

b. Contractor Considerations

(1) A prime contractor cannot modify the DBE Commitment through reduction in participation, termination, or replacement of a DBE subcontractor listed on the approved DBE Commitment without prior written consent from the DBE Office. This includes, but is not limited to, instances in which a prime contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

(2) If a prime contractor reduces participation, replaces, or terminates a DBE subcontractor who has been approved for DBE credit toward its contract, the prime is required to provide documentation supporting its inability to fulfill the contractual commitment made to the Department regarding the DBE utilization.

(3) The Prime Contractor is required to demonstrate efforts to find another DBE subcontractor to perform at least the same amount of work under the contract as the DBE subcontractor that was terminated, to the extent needed to meet the assigned DBE contract goal. When additional opportunity is available by contract modifications, the Prime Contractor must utilize DBE subcontractors that were committed to equal work items, in the original contract.

(4) In circumstances when a DBE subcontractor fails to complete its work on the contract for any reason, or is terminated from a contract, the Prime Contractor must undertake efforts to maintain its commitment to the assigned DBE goal.

(5) The DBE subcontractor should communicate with the Prime Contractor regarding its schedule and capacity in the context of the contract. If the DBE firm anticipates that it cannot fulfill its subcontract, they will advise the Prime Contractor and suggest a DBE subcontractor that may replace their services and provide written consent to be released from its subcontract.

i. Before the Prime Contractor can request modification to the approved DBE Commitment, the Prime Contractor must:

a. Make every effort to fulfill the DBE Commitment by working with the listed DBE subcontractor to ensure that the firm is fully knowledgeable of the Prime Contractor's expectations for successful performance on the contract. Document these efforts in writing.

b. If those efforts fail, provide written notice to the DBE subcontractor of the Prime Contractor's intent to request to modify the Commitment through reduction in participation, termination, and/or replacement of the subcontractor including the reason(s) for pursuing this action.

c. Copy the DBE Office on all correspondence related to changing a DBE subcontractor who has been approved for DBE credit on a contract, including preparation and coordination efforts.

d. Clearly state the amount of time the DBE firm has to remedy and/or respond to the notice of intent to replace/terminate. The DBE must be allowed five days from the date notice was received as indicated by email time stamp or signed certified mail, to respond, in writing. EXCEPTION: The Prime Contractor must provide a verifiable reason for a response period shorter than five days. For example, a WisDOT project engineer or project manager confirms that WisDOT has eliminated an item the DBE subcontractor was contracted for.

e. The DBE subcontractor must acknowledge the contract modification with written response to the Prime Contractor and the DBE Office. If objecting to the subcontract modification, the DBE subcontractor must outline the basis for objection to the proposed modification, providing sound reasoning for WisDOT to reject the prime's request.

c. Request to Modify DBE Subcontracting Commitment

The written request referenced above may be delivered by email or fax. The request must contain the following:

(1) Project ID number

(2) WisDOT Contract Project Engineer's name and contact information

(3) DBE subcontractor name and work type and/or NAICS code

(4) Contract's progress schedule

(5) Reason(s) for requesting that the DBE subcontractor be replaced or terminated

(6) Attach/include all communication with the DBE subcontractor to deploy/address/resolve work completion

Naming conventions: When emailing files, please use the following language to identify your submission- "Project #, Proposal #, Let date, Business Name, MODIFICATION" Email: DBE_Alert@dot.wi.gov + Project Engineer

WisDOT will review the request and any supporting documentation submitted to evaluate if the circumstance and the reasons constitute good cause for replacing or terminating the approved DBE subcontractor.

Good Causes to Replace a DBE subcontractor according to the federal DBE program guidelines {49 CFR part 26.53}

- The listed DBE subcontractor fails or refuses to execute a written contract
- The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor
- The listed DBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements
- The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness
- The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215, and 1,200 or applicable state law
- The prime has determined that the listed DBE subcontractor is not a responsible contractor
- The listed DBE subcontractor voluntarily withdraws from the project and provides written notice of its withdrawal
- The listed DBE subcontractor is ineligible to receive DBE credit for the type of work required

- A DBE firm owner dies or becomes disabled with the result that the listed DBE subcontractor is unable to complete its work on the contract.

d. Evaluation and Response to the Request

WisDOT's timely response to the Prime Contractor's request for modification of the approved DBE Commitment will be provided to the prime and the WisDOT project engineer via email.

If WisDOT determines that the Prime Contractor's basis for reduction in participation, replacement, or termination of the DBE subcontractor is not consistent with the good cause guidelines, the DBE office will provide a response via email within 48-hours of receipt of request from the Prime Contractor as indicated by email time stamp. The communication will include: the requirement to utilize the committed DBE, actions to support the completion of the contractual commitment, a list of available WisDOT support services, and administrative remedies, including withholding payment to the prime, that may be invoked for failure to comply with federal DBE guidelines for DBE replacement.

The WisDOT contact for all actions related to modification of the approved DBE Commitment is the DBE Program Engineer who can be reached at DBE_Alert@dot.wi.gov or (414) 335-0413.

e. DBE Utilization beyond the approved DBE Commitment

When the prime or a subcontractor increases the scope of work for an approved DBE subcontractor or adds a DBE subcontractor who was not on the approved form DT1506 or DBE Commitment submitted with bid at any time after contract execution, this is referred to as voluntary DBE contract goal achievement. The contractor must follow these steps to ensure that the participation is accurately credited toward the DBE goal:

(1) Forward a complete, signed Attachment A form to the DBE Office. A complete Attachment A includes DBE subcontractor contact information, signatures, subcontract value, and description of the work areas to be performed by the DBE. The DBE Office will verify the DBE participation and revise the DBE Commitment based on the email/discussion and the new Attachment A.

(2) When adding to an existing DBE Commitment, submit a new Attachment A to the DBE Alert mailbox

(3) OR Submit a final Attachment A to DBE Alert during the Finals Process when Compliance receives notice of "Substantially Complete"

Naming conventions: When emailing files, please use the following language to identify your submission- "Project #, Proposal #, Let date, Business Name, New Attachment A" Email: DBE_Alert@dot.wi.gov

Special note on trucking

- DBE truckers added to the sublets in CRCS *will* be approved without DBE credit (You will see a "N" in CRCS instead of "Y")
- Prime Contractors may enter a "place holder" e.g. $1000.00, for DBE Trucking in CRCS if the full amount of trucking is unknown for sublet purposes only
- The hiring contractor may obtain the Attachment A with DBE signature included but the **Prime Contractor** must sign the Attachment A before submitting
- DBE truckers need to be added to the DBE commitment once. If the DBE trucker is on the initial commitment (DT1506/E1506) there is no requirement to submit another Attachment A for that trucker for that contract.

10. Commercially Useful Function

a. Commercially Useful Function (CUF) is evaluated after the contract has been executed, while the DBE certified firm is performing contracted work items.

b. The Department uses Form DT1011, DBE Commercially Useful Function Review and Certification to evaluate if the DBE is performing a commercially useful function. WisDOT counts expenditures of a DBE toward the DBE goal only if the DBE is performing a commercially useful function on that contract.

c. A DBE firm is performing a commercially useful function if the following conditions are met:

(1) For contract work, the DBE is responsible for executing a distinct portion of the work and is carrying out its responsibilities by actually performing, managing, and supervising that work.

(2) For materials and supplies, the DBE is responsible for negotiating price, determining quality and quantity, ordering, and paying for those materials and supplies.

d. Offsite Hauling – when DBE truck will haul between a pit and plant or location other than the construction site associated with the commitment

(1) Indicate Offsite Hauling on Attachment A

(2) Discuss offsite hauling at weekly progress meetings with Project Engineer (PE)

(3) PE conducts spot checks of pits/plants to verify DBE truck is hauling and/or verifying hauling log

(4) Prime should be prepared to submit haul tickets, plant/pit tickets, timecards, and other pertinent documentation if requested by PE or DBE Office

11. Credit Evaluation for DBE Primes

WisDOT calculates DBE credit based on the amount and type of work performed by DBE certified firms for work submitted with required documentation. If the prime contractor is a DBE certified firm, the Department will only count the work that the DBE prime performs with its own forces for DBE neutral credit. The Department will also calculate DBE credit for work performed by any other DBE certified subcontractor, DBE certified supplier, and DBE certified manufacturer on the contract in each firm's approved NAICS code/work areas that are submitted with required documentation. Crediting for manufacturers and suppliers is calculated consistent with Section 8 of this document and 49 CFR Part 26.

12. Joint Venture

A joint venture is an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest. If a DBE performs as a participant in a joint venture, the Department will only credit the portion of the total dollar value of the contract equal to the portion of the work that the DBE performs with its own forces.

13. Mentor-Protégé

a. If a DBE performs as a participant in a mentor-protégé agreement, the Department will credit the portion of the work performed by the DBE protégé firm.

b. DBE credit is evaluated and confirmed by the DBE Office for any contracts on which the mentor-protégé team identifies itself to the DBE Office as a current participant of the Mentor-Protégé Program.

(1) DBE credit may only be awarded to a non-DBE mentor firm for using its own protégé firm for less than one half of its goal on any contract; and

(2) Not award DBE credit to a non-DBE mentor firm for using its own protégé firm for more than every other contract performed by the protégé firm.

c. A DBE protégé firm may be eligible for conditional NAICS code extension for training with the mentor. Request permission from the DBE Office- Certification area.

d. Refer to WisDOT's Mentor-Protégé guidelines for guidance on the number of contracts and amount of DBE credit allowed on WisDOT projects.

14. Use of Joint Checks

The use of joint checks is allowable if it is a commonly recognized business practice in the material industry. A joint check is defined as a two-party check between a DBE subcontractor, a prime contractor, and the regular dealer or materials supplier who is neither the prime nor an affiliate of the prime. Typically, the prime contractor issues one check as payor to the DBE subcontractor and to the supplier jointly (to guarantee payment to the supplier) as payment for the material/supplies used by the DBE firm in cases where the DBE subcontractor and materials have been approved for DBE credit. The DBE subcontractor gains the opportunity to establish a direct contracting relationship with the supplier to potentially facilitate a business rapport that results in a line of credit or increased partnering opportunities.

The cost of material and supplies purchased by the DBE firm is part of the value of work performed by the DBE to be counted toward the goal. To receive credit, the DBE firm must be responsible for negotiating price, determining quality and quantity, ordering the materials, and installing (where applicable) and "paying for the material itself." See 49 CFR 26.55(c)(1).

The approval to use joint checks constitutes a commitment to provide further information to WisDOT, upon request by staff. WisDOT will allow the use of joint checks when the following conditions are met:

a. The Prime Contractor must request permission to use joint checks from the DBE Office by submitting the Application to Use Joint Checks.

(1) Request should be made when the DBE Commitment or the Request to Sublet is submitted; the request will not be considered if submitted after the DBE Subcontractor starts its work.

(2) Approval/Permission must be granted prior to the issuance of any joint checks.

(3) The payment schedule for the supplier must be presented to the DBE office before the first check is issued.

(4) The joint check for supplies must be strictly for the cost of approved supplies.

b. The DBE subcontractor is responsible for furnishing and/or installing the material/work item and is not an ‘extra participant’ in the transaction. The DBE firm’s role in the transaction cannot be limited solely to signing the check(s) to release payment to the material supplier. At a minimum, the DBE subcontractor’s tasks should include the following:

(1) The DBE subcontractor (not the prime/payor) negotiates the quantities, price, and delivery of materials.

(2) The DBE subcontractor consents to sign/release the check to the supplier by signing the Application to Use Joint Checks after establishing the conditions and documentation of payment within the subcontract terms or in a separate written document.

c. The Prime contractor/payor acts solely as a guarantor.

(1) The Prime Contractor agrees to furnish the check used for the payment of materials/supplies under the contract.

(2) The prime contractor/payor cannot require the subcontractor to use a specific supplier or the prime contractor’s negotiated unit price.

15. Payment

Costs for conforming to this Additional Special Provision (ASP) and any associated DBE requirements are incidental to the contract.

Appendix A
Substantive Conversation Guidelines

The substantive conversation is critical to all bidders' demonstration of good faith effort to meet the DBE goal prior to bid opening. Relationship building between primes and subcontractors is crucial to DBE goal attainment. Responsible bidders seek to build rapport with potential DBE subcontractors to understand capacity, areas of expertise, and assess contracting feasibility. Bidders who compete for WisDOT contracts are specialty contractors responding to a growing and changing contract environment. Just as these specialists are responsible for care of the roads, they are likewise responsible for contributing to the health of the industry. The substantive conversation drives collaboration that will build industry health and capacity. The following is intended to provide guidance for such discussions but is not an exhaustive list. Contractors are encouraged to incorporate their existing strategies for cultivating business relationships as well.

Prior to Bid Opening- this discussion should happen as early as possible (WisDOT advertisements are released weeks prior to each Let)

1. Determine DBE subcontractor's interest in quoting
2. If response indicates inexperience with quoting- offer support/assistance to the DBE in understanding the industry including fundamentals a subcontractor needs to know, required reading and/or resources.
3. Assess their interest and experience in the road construction industry by asking questions such as:

- Have you competed for other WisDOT contracts? Ratio of competed/to wins
- Have you performed on any transportation industry contracts (locally or with other states)?
- What the largest contract you've completed?
- Have you worked in the industry: apprentice, journeyman, safety, inspection etc.?
- Does this project fit into your schedule? Are you working on any contracts now?
- Have you reviewed a copy of the plans? Are you comfortable performing within the scope and quantity considerations of this contract?
- What region do you work in? Home base?
- Which line items are you considering?
- Have you read/are you familiar with WisDOT Standard Specifications? Construction Material Manual?
- Do you understand where your work fits in the project schedule, project phases?

Following Bid Opening- this discussion can happen at any time

1. After reviewing their quote, note the following in your discussion:

- Does the quote look complete? Irregular?
- Are there errors in the quote? Are items very high or very low?
- In general, does the quote look competitive?

2. Questions and Advice for the bidder to share with the potential DBE subcontractor:

- What line items would typically be in a competitive quote for a subcontractor of their specialty?
- How many employees and what is their role/experience/expertise in your firm?
- Do you have resources for labor (union member, family-based, community-resourced) and capital (banking relationship, bond agent, CPA)?
- Where have you worked: cities, states, government, commercial, residential/private sector, etc. Explain similarities or differences.
- Refer them to reliable, trusted, industry resources that can educate or connect them to relevant resources, education/certification resources, more appropriate contract opportunities.
- Discussion about prime contract and subcontract liability, critical path items, contract quantities, schedule risks, and potential profit/loss (for upcoming known projects or in general).
- Discussion of bonding, insurance, and overall business risk considerations.

Appendix B

Sample Contractor Solicitation Letter Page 1

(This sample is provided as a guide, not a formatting requirement)

DBE Solicitation - [Month] [Day], [Year] WisDOT Bid Letting

Attention all DBEs. [Prime Contractor] is actively seeking your quote for the [Month][Day], [Year] Bid Letting. [Prime Contractor] is considering bidding on the projects listed on page 2 as a prime contractor. Please see page 2 for instructions and the sub-contractable opportunities for each proposal.

Does [Prime Contractor] accept quotes in areas we might self-perform? Yes, we do! We support this federal rule and (if needed) we consider areas we might self-perform an opportunity to provide in the field assistance and training if we award your quote.

Where can DBEs find the plans, specifications & addenda? Please visit [Prime Contractor's] plan room [LINK] or on WisDOT's Highway Construction Contract Information HCCI website: Wisconsin Department of Transportation Highway Construction Contract Information (wisconsindot.gov). This same website can be checked for the contract status.

What should your quote include? All the costs required to complete the items you propose to perform including labor, equipment, material, and related bonding or insurance. The quote should also note items that you are DBE certified to perform, tied items, and any special terms. Please use page 2 as your cover sheet for your quote.

Do you have a question regarding bonding, credit, insurance, equipment, or supplies/materials? We welcome all DBE questions! Please call [Prime Contractor] and ask to speak with [Contact]. [Prime Contractor] can provide basic information as well as a referral to a trusted industry partner for insurance and bonding needs.

When are quotes due?

[Month] [Day], [Year] at [Time]. We accept quotes via SBN, email, or fax. Please make every effort to have your quotes in by this time or earlier. Quality check your quote so it includes the correct letting date, project ID, proposal number, unit price and extension.

Who can DBEs contact for questions, information, clarification or for a quote evaluation? [Project Manager Name] [Phone] [Email]. If you are quoting [Prime Contractor] for the first time, we encourage you to come meet with us in person to discuss the project. Our office hours are 7:30 a.m. – 5:00 p.m. On bid day, we are in the office by 6:30 a.m.

Why partner with [Prime Contractor]?

DBE partnership is a core part of [Prime Contractor's] mission. Including DBEs at the beginning of each project is essential in the success of each project. We consider DBEs to be important industry partners who bring dedication and knowledge at various stages during construction. We are proud to be an industry leader with our DBE partnership. Your success as a DBE is our success.

Sample Contractor Solicitation Letter Page 2

(This sample is provided as a guide, not a formatting requirement)

REQUEST FOR QUOTE

[Prime Contractor]
Letting Date: [Month] [Day], [Year]
Project IDs: 1234-56-00 (Proposal #1) & 1234-01-78 (Proposal #6)

Please check all that apply:
____Yes, we will be quoting the projects & items listed below
____ No, we are not interested in quoting on the letting or its items referenced below
____ Please take our name off your monthly DBE contact list
____ We have questions about quoting this letting. Please have someone contact me at this number:

Prime Contractor Contact:_____ DBE:_____
Phone:_____ Fax:_____
Email:_____

Please circle the proposals and items you will be quoting below and contact us with any questions

Proposal **County**	**1** **Dane County**	**6** **Crawford County**
Clearing & Grubbing	**X**	**X**
Dump Truck Hauling	**X**	**X**
Curb/Gutter/Sidewalk	**X**	
Erosion Control Items		**X**
Excavation	**X**	**X**
Pavement Marking		**X**
Traffic Control	**X**	
Sawing	**X**	**X**
QMP, Base		**X**
Pipe Underdrain	**X**	
Landscape		**X**
Beam Guard	**X**	
Electrical	**X**	
Signs/Posts/Markers		**X**
Survey/Staking		**X**

Again, please make every effort to have your quotes into our office by time deadline prior to the letting date.

Sample Contractor Solicitation Email - Simplified

(This sample is provided as a guide, not a formatting requirement)

ATTENTION DBEs

- **[Prime Contractor] specializes in municipal projects in the XX Region(s)**
- **We have successfully competed for *and* completed XX WisDOT projects over the past XX years**
- **Consider [Prime Contractor] your partner on WisDOT Projects**

[Prime Contractor] is seeking *your* subcontractor quote for the XX/XX/20XX WisDOT bid letting on the below projects:

Project	Proposal	County	Region
1234-56-00	**2**	**Dane**	**SW**
1234-01-78	**6**	**Crawford**	**SW**

- Please review the attachments **[attach Solicitation Letter]** and respond with your intent to quote (or not) along with the work items you are interested in performing and respond via fax or email by ***date***. The quote should note items that you are DBE certified to perform, tied items, and any special terms. Please include labor, equipment, material, and related bonding or insurance.

- If you have any questions regarding bonding, credit, insurance, equipment and/or materials/supplies, please feel free to call [Prime Contractor] and ask for [Contact]. **(Include if your company is willing to answer these types of DBE questions)**

- Plans and Specifications can be found: **WisDOT HCCI Website: List webpage where plans are located**

- If you do choose to quote, please make every effort to have your quote into our office by ***time and date.*** Make sure the correct letting date, project number, unit price and extension are included in your quote.

- Should you have questions regarding the mentioned project, please call our office at (414) 555-5555 and we will direct you to the correct estimator/project manager.
  Our office hours are 7:30 a.m. - 5:00 p.m.

Thank you – we look forward to working with your company on this project!

Prime Contractor
Project Manager
Direct: 414-555-5555
Cell: 414-555-5556

Sample Contractor Solicitation Email to non-DBE WisDOT Subcontractors - Simplified

(This sample is provided as a guide, not a formatting requirement)

ATTENTION WisDOT SUBCONTRACTORS

[Prime Contractor] is considering bidding on the below projects for the XX/XX/20XX WisDOT Bid Letting:

Project	Proposal	County	Region	DBE Goal
1234-56-00	2	Dodge	SW	6.00%
1234-01-78	11	Adams	NC	3.00%
1234-00-99	20	Buffalo	NW	5.00%
1234-00-98	33	Portage	NC	6.00%

The above projects have DBE goals and [Prime Contractor] is committed to DBE inclusion with every project. As such, we are requesting:

- All WisDOT Subcontractors to **solicit and utilize** DBEs in your quotes.
- DBE participation can be achieved through purchasing materials from DBE suppliers, using DBE subcontractors and/or DBE trucking firms or any combination of these.
- If there is an opportunity to untie an item in your quote so a DBE can be utilized, please look for those opportunities as well.
- Your quote will be evaluated based on the amount of DBE participation your company is able to provide when compared to other quotes for the same work.

If you do choose to quote, please make every effort to have your quote into our office by **time and date.** Please submit all quotes to [Email]. Make sure the correct letting date, project number, unit price and extension are included in your quote.

Should you have questions regarding the mentioned project, the Project Manager contact is: [Name] [Phone Number] [Email]

Thank you for utilizing DBEs who are trusted industry partners with WisDOT projects.

Prime Contractor
Project Manager
Direct: 414-555-5555
Cell: 414-555-5556

Appendix C
Small Business Network (SBN) Overview

The Small Business Network is a part of the Bid Express® service that was created to ensure that prime bidders have a centralized online location to find subs - including small and disadvantaged business enterprises (DBEs). It is available for prime bidders to use as part of their Basic Service subscription. Within the Small Business Network, **Prime Contractors** can:

1. Easily select proposals, work types and items:
    a. After adding applicable work types, select items that you wish to quote. Enter the sub-quote quantities and add comments, if desired. Adding or removing items and work types can be done quickly. If needed, you can save the sub-quote for later completion.
2. Create sub-quotes for the subcontracting community:
    a. Create sub-quotes with ease using the intuitive sub-quote creator. In seven short steps, you can rapidly create a custom sub-quote directed to all subcontractors that bid on the applicable work types. Steps include: provide contact information and sub-quote expiration date, select letting and proposal, add work types and items, specify terms and conditions, upload attachments, and select vendors.
    b. Create a sub-quote to send to subcontractors or suppliers that lists the items in a proposal that you want quoted
    c. Create an unlimited number of sub-quotes for items you want quoted, and optionally mark them as a DBE preferred request.
    d. Add attachments to sub-quotes.
3. View sub-quote requests & responses:
    a. After logging into the Bid Express service, you can quickly review all of your sub-quote requests and all unsolicited sub-quote requests from subcontractors. To simplify the Small Business Network home screen, sub-quote requests can be hidden with one click if they are not applicable.
    b. View or receive unsolicited sub-quotes that subcontractors have posted, complete with terms, conditions and pricing.
4. View Record of Subcontractor Outreach Effort:
    a. For each sub-quote produced, a *Record of Subcontractor Outreach Effort* is generated that shows the response statistics for a particular sub-quote. If accepted by the letting agency, this report may serve as proof of a “Good Faith” effort in reaching out to the DBE community.
    b. Easily locate pre-qualified and certified small and disadvantaged businesses.
    c. Advertise to small and disadvantaged businesses more efficiently and cost effectively.
    d. Document your interactions with subs/DBEs by producing an Outreach Report (may be accepted as proof of DBE outreach at the discretion of each agency).

The Small Business Network help small businesses learn more about opportunities, compete more effectively, network with other contractors and subcontractors, and win more jobs. The DBE will provide free SBN accounts to DBEs when requested. Use DBE_Alert@dot.wi.gov to request an account. **DBE firms can:**

1. View and reply to sub-quote requests from primes:
    a. After logging into the Bid Express service, you can quickly review all incoming sub-quote requests and all unsolicited sub-quotes created by your company. Receive notifications by selected work type. To simplify on the Small Business Network home screen, sub-quote requests can be filtered by work types relevant to your interests or hidden with one click if they are not applicable.
2. Select items when responding to sub-quote requests from primes:
    a. You have the freedom to choose and price any number of items when responding to a sub-quote request. Quantities can be modified, and per-item comments are also available.
    b. View requests for sub-quotes for work that primes have posted for projects they are bidding, add your pricing, terms, and conditions, and submit completed sub-quotes to the requesting primes. c. Add attachments to a sub-quote.
3. Create and send unsolicited sub-quotes to specific contractors:
    a. Create unsolicited sub-quotes with ease using the intuitive sub-quote creator. In eight short steps, you can rapidly create a custom sub-quote directed at any number of specific vendors of your choosing. Steps include: provide contact information and sub-quote expiration date, select letting and proposal, add work types and items, specify terms and conditions, upload attachments, and select vendors.
4. Easily select and price items for unsolicited sub-quotes:
    a. After adding applicable work types, select items that you wish to quote. The extended price calculates automatically, cutting out costly calculation errors. Comments can be provided on a per-item basis as well.
    b. Create an unsolicited sub-quote that lists the items from a proposal that you want to quote, include pricing, terms and conditions, and send it to selected prime/plan holder.
    c. Add attachments to a sub-quote.
    d. Add unsolicited work items to sub-quotes that you are responding to.
5. Easy Access to Valuable Information
    a. Receive a confirmation that your sub-quote was opened by a prime.
    b. View Bid Tab Analysis data from past bids, including the high, average and low prices of items.
    c. View important notices and publications from DOT targeted to small and disadvantaged businesses.
6. Accessing Small Business Network for WisDOT contracting opportunities
    a. If you are a contractor not yet subscribing to the Bid Express service, go to **www.bidx.com** and select “Order Bid Express.” The Small Business Network is a part of the Bid Express Basic Service.

Appendix D

Good Faith Effort Evaluation Measures *by categories referenced in DBE regulations*

Bidders must demonstrate that they took all necessary and reasonable steps to achieve the assigned DBE contract goal. For each contract, all bidders must submit documentation indicating the goal has been met or if falling short of meeting the assigned goal, must request a DBE Goal Waiver and document all efforts employed to secure DBE subcontractor participation on Form DT1202.

DBE staff analyze the bidder's documented good faith efforts to determine if action taken was sufficient to meet the goal. Sufficiency is measured contract-by-contract. WisDOT evaluates active and aggressive efforts, quality, quantity, scope, intensity, and appropriateness of the bidder's efforts as a scale of the principles of Good Faith outlined in 49 CFR Part 26, Appendix A. Additional emphasis is placed on the bidder's demonstration of timely submission of documentation and communication with DBE subcontractors, and business development initiatives undertaken to support DBE firm growth.

The following is a sample of good faith effort activities that are rated according to the accompanying rubric. Contractors are encouraged to identify additional activities that align with their business type(s).

- Personal, tailored solicitation to firms that specialize in work types planned or desired for subcontracting
- Follow up to initial solicitation via email or phone
- Substantive conversation including topics such as contract liability, critical path work items, schedule risks, and potential profit/loss
- SBN utilization including posting quotes
- Review and response to DBE quotes including provision of information about plans, specifications,and requirements as applicable
- Documentation requesting subcontractors support DBE goal by solicitation and inclusion of DBE subcontractor quotes
- Responsive and timely submission of organized documentation
- Analysis of number of DBE firms who do work types that you typically subcontract
- Analysis of number of DBE firms who reside in geographical areas where prime seeks work
- Analysis of firms who express interest in bidding/quoting including the number of firms who declined your solicitation
- Reference check of DBE subcontractor work or training (documentation of questions and response required)
- Number of different efforts undertaken to meet the assigned DBE goal as documented in accompanying Form DT1202
- Submission of all DBE quotes received matched with a variety of work to be performed by DBEs
- Number and names of DBE firms provided written advice, or referral to industry-specific business development resources
- Overall pattern of DBE utilization on all WisDOT contracts which may include contracting with municipalities
- Documentation of resources expended to meet assigned DBE goal (#of hours, staff titles, average pay rate, actions taken)
- Analysis of subcontractable work items to be completed by prime beyond prime contractor's 30%
- Risk analysis of work items that are typically in tied quotes that could be unbundled
- List of contract work items in smallest economically feasible units, identifying schedule impact
- Submission of a Gap Analysis identifying DBE skillset and/or industry needs
- Staff training in EEO and Civil Rights laws as documented in training logs
- Written Capacity Assessment completed with DBE firm documenting its ability to perform the work quoted
- DBE engagement efforts beyond simple solicitation that include a substantive discussion, initiated as early in the acquisition process as possible (*points added for each day prior to letting*)
- Outreach and marketing efforts with minority, women, and veteran-focused organizations at least 10 days prior to bid opening
- Active involvement in WisDOT's Business Development Program, TrANS training, facilitated networking efforts, workshops
- Customized teaching/training efforts for future opportunities with DBE subcontractor, contract specific and/or annually
- Introduction and reference provided for DBE subcontractor to a prime who has not previously contracted with the DBE firm
- Prime utilization of a DBE subcontractor the prime has not contracted with previously
- Written referral/recommendation to bond/insurance agents, manufacturer, supplier
- Documented efforts fostering DBE participation through administrative and/or technical assistance
- Evidence of negotiation with the DBE firm about current and future Let opportunities
- Recommendation of local and state services that support small business and access to opportunity: DOA, SBA, WEDC, WPI, etc.
- Advice on bonding, lines of credit, or insurance as required to complete the items quoted and contract requirements

GFE Evaluation Rubric – Phase 1 – Initial Review

DT1202	Examples	Rating	OBOEC Feedback
Solicitation Documentation	Identify all reasonable and available activities performed to solicit the interest of all certified DBEs who have capacity and ability to perform work on the project. *Such as: Updated solicitation letter and email, timely solicitation, and follow-up, and/or utilized various methods to communicate solicitation (ex: letter, email, publication, posting and/or website)*		
Selected Work Items Documentation	All work items are broken out into economically feasible units to facilitate DBE participation. *Such as: Selected work items are specific to each proposal and clearly identified in all solicitation(s)*		
Documentation of Project Information provided to Interested DBEs	Provide interested DBEs with adequate information about the plans, specifications, and any other contractual requirements in a timely manner to assist DBEs in response to solicitation. *Such as: Project information is clearly identified in all solicitation(s)*		
Documentation of Negotiation with Interested DBEs	Provide sufficient evidence demonstrating that good faith negotiations took place during the bid letting. *Such as: Documented attempts with DBEs or on behalf of DBEs to increase DBE participation*		
Documentation of Sound Reason for Rejecting DBEs	Provide sufficient evidence demonstrating that DBEs are rejected for sound reasons. *Such as: Detailed and thoughtful analysis that considers both the percentage and dollar difference when rejecting a DBE including past performance, relevant business experience and stability, safety record, business ethic and integrity, technical capacity, and other tangible factors.*		
Documentation of Assistance to Interested DBEs- bonding, credit, insurance, equipment, supplies/materials	Documented assistance in both solicitation(s) and outreach to DBEs.		
Documentation of Outreach to Minority, Women, and Community organizations and other DBE Business Development Support	Effectively use the services of minority, women, and community organizations as well as contractors' groups, local, state, and federal business assistance offices and organization that provide assistance in recruiting and supporting DBEs, as well participation in activities that support DBE business development. *Such as: Variety of activities that translate into meaningful DBE participation*		
Documentation of other GFE activities	*Such as: Used DT1202 Excel Workbook, Diversity & Inclusion company policy, Mentor-Protégé participant, awarded neutral DBE after bid submission, included company GFE overview/strategy information and/or company website highlights DBE opportunities and participation*		
Overall Demonstration of GFE			

GFE EVALUATION RATING LEGEND – PHASE 1 – Initial Review

Documentation provided by bidder is evaluated and rated on the rubric. Bidders should include activities characterized by the following types of effort:

ACTIVE & AGGRESSIVE: Demonstrated through engaged and assertive activity
QUALITY: Demonstrated through essential character of conscientious and serious activity
QUANTITY: Demonstrated through a measurable number of activities
SCOPE & INTENSITY: Demonstrated through a rigorous approach to an appropriate and purposeful range of activities
TIMING: Demonstrated through engagement efforts beyond simple solicitation, initiated early in the process

GFE EVALUATION – PHASE 2 – Team Review

GFE Team completes:

- Review of activities included on the rubric
- Review of the intent to award and sound reasoning submitted by Prime
- Bid analysis to confirm if any bid submitted met the DBE goal
- Review average of other bidders DBE goal achievement
- Team review of combined efforts documented in Phase 1 and 2 constitute final GFE determination

Rating Scale:

- GFE Approval:
  Bona Fide = 6 or more categories color coded green.
  Genuine effort characterized by sincere and earnest activities – "Solicitation" and "Sound Reasoning" must be green

- GFE Approval:
  Sufficient = 5 or more categories color coded green or yellow
  Adequate effort documented with a variety of quality activities – "Solicitation" and "Sound Reasoning" must be green or yellow

- GFE Denial:
  Pro Forma efforts = 4 or less categories color coded green or yellow. Perfunctory effort characterized by routine or superficial activities

Green = Exceeds expectations
Yellow = Meets expectations
Red = Areas in need of attention and/or absence of documentation See OBOEC Rubric Analysis_Feedback

Excerpt from Appendix A to 49 CFR Part 26:
V. In determining whether a bidder has made good faith efforts, it is essential to scrutinize its documented efforts. At a minimum, you must review the performance of other bidders in meeting the contract goal. For example, when the apparent successful bidder fails to meet the contract goal, but others meet it, you may reasonably raise the question of whether, with additional efforts, the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the goal but meets or exceeds the average DBE participation obtained by other bidders, you may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made good faith efforts. As provided in §26.53(b)(2)((vi), you must also require the contractor to submit copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract to review whether DBE prices were substantially higher; and contact the DBEs listed

GFE RUBRIC ANALYSIS	
OBOEC DECISION	APPROVAL OR DENIAL
Prime Contractor	
Proposal	
Project	
Bid Letting	
DBE Goal Amount	
DBE Goal Amount Achieved	
Bid Analysis	
Goal %	Achieved %
Apparent Low Bidder	%
Bidder B	
Bidder C	
Average of OTHER Bidders (Not including Apparent Low Bidder)	
DBE Quotes Received	
DBE Quotes Awarded	
DBE Quote(s) Rejected	**Rejected Quote Analysis**
DBE Quote(s) Awarded	**Awarded DBE Amount**

Appendix E
Good Faith Effort Best Practices

This list is not a set of requirements; it is a list of potential strategies

Primes

- Prime contractor open houses inviting DBE firms to see the bid "war room" or providing technical assistance.
- Participate in speed networking and mosaic exercises as arranged by DBE office.
- Host information sessions not directly associated with a bid letting.
- Participate in a formal mentor protégé or joint venture with a DBE firm.
- Participate in WisDOT advisory committees i.e. TRANSAC, or Mega Project committee meetings.
- Facilitate a small group DBE 'training session' clarifying how your firm prepares for bid letting, evaluates subcontractors, preferred qualifications, and communication methods.
- Encourage subcontractors to solicit and highlight DBE participation in their quotes to you.
- Quality of communication, not quantity creates the best results. Contractors should be thorough in communicating with DBE firms before the bid and provide any assistance requested to assure best possible bid.

DBE

- DBE firms should contact primes as soon as possible with questions regarding their quotes or bid; seven days prior is optimal.
- Continually check for contract addendums on the HCCI website through the Thursday prior to letting to stay abreast of changes.
- Review the status of contracts on the HCCI website reviewing the 'apparent low bidder' list and bid tabs at a minimum.
- Prepare a portfolio or list of related projects and prime and supplier references; be sure to note transportation related projects of similar size and scope, firm expertise and staffing.
- Participate in DBE office assessment programs.
- Participate on advisory and mega-project committees.
- Sign up to receive the DBE Contracting Update.
- Consider membership in relevant industry or contractor organizations.
- Active participation is a must. Quote as many projects as you can reasonably work on; quoting the primes and bidding as a prime with the Department are the only ways to get work.

Appendix F
Good Faith Effort Evaluation Guidance
Appendix A of 49 CFR Part 26

I. When, as a recipient, you establish a contract goal on a DOT-assisted contract for procuring construction, equipment, services, or any other purpose, a bidder must, in order to be responsible and/or responsive, make sufficient good faith efforts to meet the goal. The bidder can meet this requirement in either of two ways. First, the bidder can meet the goal, documenting commitments for participation by DBE firms sufficient for this purpose. Second, even if it doesn't meet the goal, the bidder can document adequate good faith efforts. This means that the bidder must show that it took all necessary and reasonable steps to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not fully successful.

II. In any situation in which you have established a contract goal, Part 26 requires you to use the good faith efforts mechanism of this part. As a recipient, you have the responsibility to make a fair and reasonable judgment whether a bidder that did not meet the goal made adequate good faith efforts. It is important for you to consider the quality, quantity, and intensity of the different kinds of efforts that the bidder has made, based on the regulations and the guidance in this Appendix.

The efforts employed by the bidder should be those that one could reasonably expect a bidder to take if the bidder were actively and aggressively trying to obtain DBE participation sufficient to meet the DBE contract goal. Mere pro forma efforts are not good faith efforts to meet the DBE contract requirements. We emphasize, however, that your determination concerning the sufficiency of the firm's good faith efforts is a judgment call. Determinations should not be made using quantitative formulas.

III. The Department also strongly cautions you against requiring that a bidder meet a contract goal (i.e., obtain a specified amount of DBE participation) in order to be awarded a contract, even though the bidder makes an adequate good faith efforts showing. This rule specifically prohibits you from ignoring bona fide good faith efforts.

IV. The following is a list of types of actions which you should consider as part of the bidder's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

A. (1) Conducing market research to identify small business contractors and suppliers and soliciting through all reasonable and available means the interest of all certified DBEs that have the capability to perform the work of the contract. This may include attendance at pre-bid and business matchmaking meetings and events, advertising and/or written notices, posting of Notices of Sources Sought and/or Requests for Proposals, written notices or emails to all DBEs listed in the State's directory of transportation firms that specialize in the areas of work desired (as noted in the DBE directory) and which are located in the area or surrounding areas of the project.

(2) The bidder should solicit this interest as early in the acquisition process as practicable to allow the DBEs to respond to the solicitation and submit a timely offer for the subcontract. The bidder should determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

B. Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units (for example, smaller tasks or quantities) to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. This may include, where possible, establishing flexible timeframes for performance and delivery schedules in a manner that encourages and facilitates DBE participation.

C. Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation with their offer for the subcontract.

D. (1) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional Agreements could not be reached for DBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

E. (1) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal. Another practice considered an insufficient good faith effort is the rejection of the DBE because its quotation for the work was not the lowest received. However, nothing in this paragraph shall be construed to require the bidder or prime contractor to accept unreasonable quotes in order to satisfy contract goals.

(2) A prime contractor's inability to find a replacement DBE at the original price is not alone sufficient to support a finding that good faith efforts have been made to replace the original DBE. The fact that the contractor has the ability and/or desire to perform the contract work with its own forces does not relieve the contractor of the obligation to make good faith efforts to find a replacement DBE, and it is not a sound basis for rejecting a prospective replacement DBE's reasonable quote.

F. Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.

G. Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

H. Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, State, and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.

V. In determining whether a bidder has made good faith efforts, it is essential to scrutinize its documented efforts. At a minimum, you must review the performance of other bidders in meeting the contract goal. For example, when the apparent successful bidder fails to meet the contract goal, but others meet it, you may reasonably raise the question of whether, with additional efforts, the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the goal, but meets or exceeds the average DBE participation obtained by other bidders, you may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made good faith efforts. As provided in §26.53(b)(2)((vi), you must also require the contractor to submit copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract to review whether DBE prices were substantially higher; and contact the DBEs listed on a contractor's solicitation to inquire as to whether they were contacted by the prime. Pro forma mailings to DBEs requesting bids are not alone sufficient to satisfy good faith efforts under the rule.

VI. A promise to use DBEs after contract award is not considered to be responsive to the contract solicitation or to constitute good faith efforts.

[79 FR 59600, Oct. 2, 2014]

Appendix G

(SAMPLE) Forms DT1506 and DT1202

Official Form DT1506 can be found here: https://wisconsindot.gov/Documents/formdocs/dt1506.pdf

COMMITMENT TO SUBCONTRACT TO DBE

Clear

Wisconsin Department of Transportation

DT1506 12/2021 s.84.06(2) Wis. Stats. ☐ Non-Traditional Project

Project ID: _____

Proposal # _____

Prime Contractor: _____

County: _____

Letting Date: _____

Total $ Value of Prime Contract: $ _____

DBE Contract Goal: _____ %

DBE Goal Achieved: 0.00 %

This contract requires that a specified percentage of the work be subcontracted to a disadvantaged business enterprise and that this information be submitted as described in ASP-3. The submittal of this form with the bid proposal constitutes your DBE commitment. Include Attachment A for DBEs included on commitment.

This form must be completed and returned for this proposal. See page 2 for instructions.

1. DBE Firm	2. Work or Items to be subcontracted	3. Supplier Y/N	4. Trucking Only	5. DBE Full Subcontract $	6. DBE Amount for Credit $
			O# L#		
			O# L#		
			O# L#		
			O# L#		
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			O# L#		
			O# L#		
			O# L#		
			O# L#		
			O# L#		
				$ 0.00	$ 0.00

Government Use Only Approved Amounts		
A =	$	%
V =	$	%
Total =	$	%

Signature:

Date:

Good faith effort approved: Yes ☐ No ☐

Prime Representative Signature & Date

DBE Office Signature & Date Approved

COMMITMENT TO SUBCONTRACT TO DBE
ATTACHMENT A

CONFIRMATION OF PARTICIPATION

Project I.D.:	Proposal Number:
Letting Date:	

Name of DBE Firm Participating in this Contract:	
Name of the Prime/Subcontractor who hired the DBE Firm: *(list all names of tiers if more than one)*	
Type of Work or Type of Material Supplied:	
Total Subcontract Value:	Total DBE Credit Value:

FOR PRIME CONTRACTORS ONLY: I certify that I made arrangements with the participating DBE firm to perform the type of work listed or supply the material indicated above for the subcontract value listed above.	Prime Contractor Representative's Signature
	Prime Contractor Representative's Name (Print Name)
	Prime Contractor (Print Company Name)
	Date

FOR PARTICIPATING DBE FIRMS ONLY: I certify that I made arrangements with the Prime Contractor or the Hiring Contractor to perform the type of work or supply the material indicated above for the subcontract value listed above.	Participating DBE Firm Representative's Signature	Date
	Participating DBE Firm Representative's Name (Print Name)	
FOR DBE TRUCKING FIRMS ONLY: I certify that I will utilize, for DBE credit, only trucks listed on my WisDOT approved Schedule of Owned/Leased Vehicles for DBE Credit form and I will be utilizing the number of trucks as listed below.	Participating DBE Firm (Print Company Name)	
	DBE Firm's Address:	

# Owned Trucks	# Leased Trucks	# DBE-Owned Leased Trucks	# Non-DBE-Owned Leased Trucks

☐ Off site Hauling

Official Form DT1506 can be found here: https://wisconsindot.gov/Documents/formdocs/dt1506.pdf

DOCUMENTATION OF GOOD FAITH EFFORT

Wisconsin Department of Transportation
DT1202 3/2020

Project ID *****	Proposal No. *****	Letting *****
Prime Contractor *****		County *****
Person Submitting Document *****		Telephone Number *****
Address *****		Email Address *****

All bidders must undertake necessary and reasonable steps to achieve the assigned DBE contract goal per federal regulatory guidance at 49 CFR Part 26. Bidders use this form to document all efforts employed to meet the assigned goal as a record of contractor good faith efforts (GFE). Refer to ASP3 or 49 CFR Part 26 for guidance on actions that demonstrate good faith effort.

It is critical to list all efforts, attach documentation, and follow the instructions to complete this submission. Documentation of good faith effort includes copies of each DBE and non-DBE subcontractor quote submitted to the bidder for the same line items. Utilize the sample documentation logs to document and organize efforts.

Submit good faith effort documentation per ASP-3 guidelines.

Instructions: Provide a narrative description of all activities pursued to demonstrate good faith efforts, any corresponding documentation, and applicable explanation on separate pages. Include the following items organized in the order listed below.

1. **Solicitation Documentation:**
   a. **Purpose:** To identify all reasonable and available activities the bidder performed to solicit the interest of all certified DBEs who have the capacity and ability to perform work on the project. All solicitation efforts should begin as early as possible to ensure DBEs have ample time to respond and ask questions.

   b. **Action:** Identify and list all activities engaged in to solicit DBEs using all reasonable and available means such as written notice and follow-up communications, substantive conversations, pre-bid meetings, networking events, market research, advertising.

2. **Selected Work Items Documentation:**
   a. **Purpose:** To ensure that all work items are broken out into economically feasible units to facilitate DBE participation. This must occur even when you prefer to perform the work yourself.

   b. **Action:** Identify economically feasible work units to be performed by DBEs to include activities such as: list of work items to be performed; breaking up of large work items into smaller tasks or quantities; flexible time frames for performance and delivery schedules.

3. **Documentation of Project Information provided to Interested DBEs:**
   a. **Purpose:** To provide interested DBEs with adequate information about the plans, specifications, and any other contractual requirements in a timely manner to assist DBEs in response to solicitation.

   b. **Action:** Provide DBEs access to plans, specifications, and other contract requirements. Early solicitation allows ample opportunity to provide project information, links to Let advertisements, and substantive engagement with DBEs.

4. **Documentation of Negotiation with Interested DBEs:**
   a. **Purpose:** To ensure that negotiations with interested DBEs were made in good faith providing evidence as to why agreements could not be reached for DBEs to perform work.

   b. **Action:** Provide sufficient evidence to demonstrate that good faith negotiations took place. Merely sending out solicitations requesting bids from DBEs does not constitute sufficient good faith efforts. A bidder using good business judgment considers a number of factors in negotiating with all subcontractors, and the firm's price and capabilities in addition to contract goals are taken into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for failing to meet the DBE goal as long as costs are reasonable. (see 49 CFR Part 26 Appendix A)

5. **Documentation of Sound Reason for Rejecting DBEs:**
   a. **Purpose:** To ensure that bidders avoid rejecting DBEs as unqualified without sound reasons. Reasons for rejection must be based on thorough investigation of DBE capabilities.

   b. **Action:** Provide sufficient evidence to demonstrate that DBE was rejected for sound reasons such as past performance, relevant business experience and stability, safety record, business ethic and integrity, technical capacity, other tangible factors.

6. **Documentation of Assistance to Interested DBEs - Bonding, Credit, Insurance, Equipment, Supplies/Materials:**
   a. **Purpose:** To assist interested DBEs in obtaining bonds, lines of credit, insurance, equipment, supplies, materials, and other assistance or services.

   b. **Action:** Assist interested DBEs in obtaining bonding, lines of credit or insurance, and provide technical assistance or information related to plans, specifications, and project requirements. Assist DBEs in obtaining equipment, supplies, materials or other services related to meeting project requirements (excluding supplies or equipment the DBE purchases from the prime).

7. **Documentation of outreach to Minority, Women, and Community Organizations and other DBE Business Development Support:**
   a. **Purpose:** To effectively use the services of minority, women, and community organizations as well as contractors' groups, local, state, and federal business assistance offices and organization that provide assistance in recruiting and supporting DBEs, as well as participation in activities that support DBE business development.

   b. **Action:** Contact organizations and agencies for assistance in contacting, recruiting, and providing support to DBE subcontractors, suppliers, manufacturers, and truckers at least 14 days before bid opening. Participate in or host activities such as networking events, mentor-protégé programs, small business development workshops, and others consistent with DBE support.

Return to:
Wisconsin Department of Transportation
DBE Program Office
PO Box 7965
Madison, WI 53707-7965
DBE_Alert@dot.wi.gov

I certify that I have utilized comprehensive good faith efforts to solicit and utilize DBE firms to meet the DBE participation requirements of this contract proposal, as demonstrated by my responses and as specified in Additional Special Provision 3 (ASP-3).

I certify that the information given in the Documentation of Good Faith Efforts is true and correct to the best of my knowledge and belief.

I further understand that any willful falsification, fraudulent statement, or misrepresentation will result in appropriate sanctions, which may involve debarment and/or prosecution under applicable state (Trans 504) and Federal laws.

(Bidder/Authorized Representative Signature)

(Print Name)

(Title)

Good Faith Effort -- Sample Documentation Logs

The sample logs below are provided as guides rather than exhaustive list. See ASP3, Appendix A for additional examples of demonstrable good faith efforts. Attach documentation for each activity listed.

Acceptable forms of documentation include copies of solicitations sent to DBEs, notes from substantive conversations and negotiations with DBEs, copies of advertisements placed, email communications, all quotes received from DBEs and from all subcontractors who were considered alongside DBE quotes, proof of attendance at applicable networking events; flyers for events or workshops for DBEs offered by the prime, and other physical records of good faith efforts activities.

SOLICITATION LOG

Date	Activity	Name of DBE Solicited	Follow-up
4/1/2020	Sent May Let solicitation	Winterland Electric	Spoke with Mark Winterland on 4/15/20 to ask if he would quote

SELECTED WORK ITEMS SOLICITED LOG

Work Type	DBE Firm	Contact Person	Date	Contact Mode
Pavement Marking	ABC Marking	Leslie Lynch	4/1/2020	Email; phone
	#1 Marking Co.	Mark Smart	4/1/2020	Email; left VM
Electrical	Winterland Electric	Tabitha Tinker	4/3/2020	Email, left VM
	Superstar Wiring	Jose Huascar	4/3/2020	Email; phone

INFORMATION PROVIDED LOG

Request Date	DBE Firm	Information Requested & Provided	Response Date
4/1/2020	Winterland Electric	Requested info on electrical requirements; provided plan and link to specs	4/3/2020
4/21/2020	Absolute Construction	Wanted to know how and when supplies are paid for by WisDOT; referred to spec that covers stockpiling	4/21/2020

NEGOTIATIONS LOG

Date	DBE Firm	Contact Name	Work Type	Quotes Rec'd?	Considered for project?	If not selected, why?
4/12/2020	ABC Landscape	John Dean	Erosion Control	Yes	No	Cannot perform all items
4/17/2020	Wild Ferns	Sandy Lynn	Erosion Control	Yes	Yes	
4/20/2020	#1 Marking	Mark Smart	Electrical	Yes	Yes	

ASSISTANCE LOG

Date	DBE Firm	Contact Person	Assistance Provided
4/1/2020	ABC Sawing	Jackie Swiggle	Informed DBE on how to obtain bonding
4/17/2020	Supreme Construction	Winston Walters	Provided contact for wholesale supply purchase

OUTREACH & BUSINESS DEVELOPMENT LOG

Date	Agency/Organization Contacted	Contact Person	Assistance Requested
4/1/2020	Women in Construction	LaTonya Klein	Contact information for woman-owned suppliers
4/28/2020	WBIC	Sam Smith	Asked for information to provide to DBE regarding financing programs through WBIC

Official Form DT1202 can be found here: https://wisconsindot.gov/pages/global-footer/formdocs/default.aspx

ADDITIONAL SPECIAL PROVISION 4

This special provision does not limit the right of the department, prime contractor, or subcontractors at any tier to withhold payment for work not acceptably completed or work subject to an unresolved contract dispute.

Payment to First-Tier Subcontractors

Within 10 calendar days of receiving a progress payment for work completed by a subcontractor, pay the subcontractor for that work. The prime contractor may withhold payment to a subcontractor if, within 10 calendar days of receipt of that progress payment, the prime contractor provides written notification to the subcontractor and the department documenting "just cause" for withholding payment.

The prime contractor is not allowed to withhold retainage from payments due subcontractors.

Payment to Lower-Tier Subcontractors

Ensure that subcontracting agreements at all tiers provide prompt payment rights to lower-tier subcontractors that parallel those granted first-tier subcontractors in this provision.

Acceptance and Final Payment

Within 30 calendar days of receiving the semi-final estimate from the department, submit written certification that subcontractors at all tiers are paid in full for acceptably completed work.

Additional Special Provision 6 (ASP-6)
Modifications to the standard specifications

Make the following revisions to the standard specifications:

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108 Prosecution and Progress

Add subsection 108.9.4.1 effective with the November 2023 letting:

108.9.4.1 Winter Suspension for Completion Date Contracts

(1) The contractor may request a winter suspension for a completion date contract. If the department determines weather conditions do not allow for the completion of the remaining work, the department may approve the contractor's request and determine the start date of the winter suspension. The end date of the winter suspension is March 31 or a date mutually agreed upon by both parties. For multi-year contracts, the department will only consider winter suspension for the final year of the contract.

(2) During winter suspension, store all materials in a manner that does not obstruct vehicular and pedestrian traffic and protect the materials from damage. Install traffic control and other safety devices necessary to protect the traveling public and pedestrians. Provide suitable drainage and install temporary erosion control where necessary. If the winter suspension begins when liquidated damages are being assessed, or when the work has not progressed as scheduled and would not have been completed prior to the completion date, the cost of necessary pre-suspension work is incidental. If the winter suspension begins prior to the contract completion date, and the work has progressed as scheduled and would have been completed prior to the completion date, the cost of pre-suspension work will be paid as specified under 109.4.

(3) For a winter suspension that begins prior to the contract completion date and the work has progressed as scheduled and would have been completed prior to the completion date, the engineer will extend contract time to correspond with the end of the winter suspension and liquidated damages will not be assessed during the winter suspension.

(4) For a winter suspension that begins when liquidated damages are being assessed or when the work has not progressed as scheduled and would not have been completed prior to the completion date, the engineer will not extend contract time. Time will be suspended until the end of the winter suspension. Liquidated damages will not be assessed during the winter suspension and liquidated damages will resume at the end of the winter suspension.

108.10.2 Excusable, Non-Compensable Delays

108.10.2.1 General

Replace entire section with the following effective with the January 2024 letting:

(1) Non-compensable delays, 108.10.2.1(3), are excusable delays not the contractor's or the department's fault. The engineer will not pay for the delay costs listed in 109.4.7 for non-compensable delays.

(2) For non-compensable delays under calendar day and completion date contracts, the engineer will extend contract time if the conditions specified in 108.10.1 are met. The department will relieve the contractor from associated liquidated damages, as specified in 108.11, if the engineer extends time under 108.10.1.

(3) The following are non-compensable delays:

1. Delays due to earthquakes, other cataclysmic phenomena of nature the contractor cannot foresee and avoid, severe weather or job conditions caused by recent weather as specified in 108.10.2.2.
2. Extraordinary delays in material deliveries the contractor or their suppliers cannot foresee and forestall resulting from strikes, lockouts, freight embargoes, industry-wide shortages, governmental acts, or sudden disasters.
3. Delays due to acts of the government, a political subdivision other than the department, or the public enemy.
4. Delays from fires or epidemics.
5. Delays from strikes beyond the contractor's power to settle not caused by improper acts or omissions of the contractor, their subcontractors, or their suppliers.
6. Altered quantities as specified in 109.3.

108.10.3 Excusable Compensable Delays

Replace entire section with the following effective with the January 2024 letting:

(1) Compensable delays are excusable delays due to the department's actions or lack of actions. The engineer will grant a time extension for a compensable delay if the conditions specified in 108.10.1 are met.

(2) The following are compensable delays:

1. A contract change for revised work as specified for extra work under 104.2.2.1, for a differing site condition under 104.2.2.2, or for significant changes in the character of the work under 104.2.2.4.
2. A contract change for an engineer-ordered suspension under 104.2.2.3.
3. The unexpected discovery of human remains, an archaeological find, or historical find consistent with 107.25.
4. The unexpected discovery of a hazardous substance consistent with 107.24.
5. The non-completion of work that utilities or other third parties perform, if that work is not completed as specified in the contract.

(3) For a compensable delay or a time extension, the department will relieve the contractor from associated liquidated damages under 108.11, and will pay the contractor for delay costs determined as follows:

1. Adjust the contract price as specified in 109.4.2 through 109.4.5 for delays under item 1 of 108.10.3(2).
2. Adjust the contract price as specified in 109.4.7 for delays under items 2 through 5 of 108.10.3(2).

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310 Open Graded Base

310.2 Materials

Replace paragraph two with the following effective with the November 2023 letting:

(2) The contractor may substitute material conforming to the gradation requirements for crushed aggregate specified in Table 310-01 if that material conforms to the fracture requirements for open-graded crushed gravel specified in 301.2.4.5.

TABLE 310-01 COARSE AGGREGATE (% passing by weight)

AASHTO No. 67[1]

SEIVE	COARSE AGGREGATE (% PASSING by WEIGHT) AASHTO No. 67
2-inch	-
1 1/2-inch	-
1-inch	100
3/4-inch	90 – 100
1/2-inch	-
3/8-inch	20 – 55
No. 4	0 – 10
No. 8	0 – 5
No. 16	-
No. 30	-
No. 50	-
No. 100	-
No. 200	<=1.5

[1] Size according to AASHTO M43.

---

390 Base Patching

390.4 Measurement

Replace entire section with the following effective with the November 2023 letting:

(1) The department will measure Removing Pavement for Base Patching by the cubic yard acceptably completed. Measure the depth from the bottom of the adjacent pavement to the top of the patch.

(2) The department will measure Base Patching Asphaltic by the ton acceptably completed as specified for asphaltic pavement in 450.4.

(3) The department will measure Base Patching Concrete HES and Base Patching Concrete SHES by the cubic yard acceptably completed. Measure the depth from the bottom of the adjacent pavement to the top of the patch.

390.5 Payment

Replace entire section with the following effective with the November 2023 letting:

(1) The department will pay for measured quantities at the contract unit price under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
390.0100	Removing Pavement for Base Patching	CY
390.0201	Base Patching Asphaltic	TON
390.0305	Base Patching Concrete HES	CY
390.0405	Base Patching Concrete SHES	CY

(2) Payment for Removing Pavement for Base Patching is full compensation for removing old pavement; for preparing the foundation and bringing up to grade. If the engineer orders the contractor to excavate yielding or unstable subgrade materials and backfill with suitable materials, the department will pay for that work with contract bid items or as agreed upon using 109.4.

(3) Payment for Base Patching Asphaltic is full compensation for providing and compacting asphaltic mixture including asphaltic binder.

(4) Payment for Base Patching Concrete HES and Base Patching Concrete SHES is full compensation for providing, curing, and protecting concrete. Payment also includes providing tie bars and dowel bars in unhardened concrete and steel within the patch. For tie bars and dowel bars provided in concrete not placed under the contract, the department will pay separately under the Drilled Tie Bars and Drilled Dowel Bars bid items as specified in 416.5.

(5) Payment for Base Patching SHES also includes providing test data to the engineer as specified in 416.2.4.

(6) The department will pay for sawing existing concrete pavement for removal under the Sawing Concrete bid item as specified in 690.5.

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460 Hot Mix Asphalt Pavement

460.2.8.2.1.3.1 Contracts with 5000 Tons of Mixture or Greater

Replace paragraph four with the following effective with the November 2023 letting:

(4) Use the test methods identified below, or other methods the engineer approves, to perform the following tests at the frequency indicated:

Blended aggregate gradations:

Drum plants:

- Field extraction by ignition oven according to WTM T308, chemical extraction according to AASHTO T-164 method A or B; or automated extraction according to WTM D8159. Gradation of resulting aggregate sample determined according to WTM T30.
- Belt samples, optional for virgin mixtures, obtained from stopped belt or from the belt discharge using an engineer-approved sampling device and performed according to WTM T11 and T27.

Batch plants:

- Field extraction by ignition oven according to WTM T308, chemical extraction according to AASHTO T-164 method A or B; or automated extraction according to WTM D8159. Gradation of resulting aggregate sample determined according to WTM T30.

Asphalt content (AC) in percent:

Determine AC using one of the following methods:

- AC by ignition oven according to WTM T308.
- AC by chemical extraction according to AASHTO T-164 method A or B.
- AC by automated extraction according to WTM D8159.
- If the department is using an ignition oven to determine AC, conform to WTP H003.
- If the department is not using an ignition oven to determine AC, ignition oven correction factor (IOCF) must still be reverified for any of the reasons listed in WTP H003 Table 2 and conform to WTP H-003 sections 3 through 6.
- Gradation of resulting aggregate sample determined according to WTM T30.

Bulk specific gravity of the compacted mixture:

According to WTM T166.

Theoretical maximum specific gravity:

According to WTM T209.

Air voids (Va) by calculation according to WTM T269.

VMA by calculation according to WTM R35.

460.2.8.3.1.4 Department Verification Testing Requirements

Replace paragraph three with the following effective with the November 2023 letting:

(3) The department will perform testing conforming to the following standards:

Bulk specific gravity (G_{mb}) of the compacted mixture according to WTM T166.

Maximum specific gravity (Gmm) according to WTM T209.

Air voids (Va) by calculation according to WTM T269.

VMA by calculation according to WTM R35.

Asphalt content by ignition oven according to WTM T308, chemical extraction according to AASHTO T-164 method A or B, or automated extraction according to WTM D8159. If using an ignition oven to determine AC, conform to WTP H-003.

460.3.3.2 Pavement Density Determinations

Replace entire section with the following effective with the February 2024 letting:

(1) The engineer will determine the target maximum density using department procedures described in WTM T355. The engineer will determine density according to CMM 815 and WTM T355 as soon as practicable after compaction and before placement of subsequent layers or before opening to traffic.

(2) Do not re-roll compacted mixtures with deficient density test results. Do not operate continuously below the specified minimum density. Stop production, identify the source of the problem, and make corrections to produce work meeting the specification requirements.

(3) A lot is defined as one day's production for each sublot type or one production shift if running 24 hours per day and placed within a single layer for each location and target maximum density category indicated in table 460-3. The lot density is the average of the tests taken for that lot. The department determines the number of tests per lot according to WTP H-002.

(4) An HTCP-certified Nuclear Density Technician I (NUCDENSITYTEC-I) or a nuclear density ACT working under a NUCDENSITYTEC-I technician, will locate samples and perform the testing. A NUCDENSITYTEC-I technician will coordinate and take responsibility for the work an ACT performs. No more than one ACT can work under a single NUCDENSITYTEC-I technician. The responsible NUCDENSITYTEC-I technician will ensure that sample location and testing is performed correctly, analyze test results, and provide density results to the contractor weekly.

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503 Prestressed Concrete Members

503.2.2 Concrete

Replace paragraph five with the following effective with the November 2023 letting:

(5) Furnish prestressed concrete members cast from air-entrained concrete, except I-type girders may use non-air-entrained concrete. Use type I, IL, IS, IP, IT, II, or III cement. The contractor may replace up to 30 percent of type I, IL, II, or III cement with an equal weight of fly ash, slag, or a combination of fly ash and slag. Ensure that fly ash conforms to 501.2.4.2.2 and slag conforms to 501.2.4.2.3. Use only one source and replacement rate for work under a single bid item. Use a department-approved air-entraining admixture conforming to 501.2.5.2 for air-entrained concrete. Use only coarse aggregate conforming to 310.2(2).

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604 Slope Paving

604.2 Materials

Replace paragraph three with the following effective with the November 2023 letting:

(3) Under the Slope Paving Crushed Aggregate bid item, furnish crushed stone or crushed gravel conforming to the gradation in Table 604-01, but with the additional requirements that at least 75 percent of the particles, by count, have at least one fractured face. Determine fracture according to WTM D5821.

TABLE 604-01 COARSE AGGREGATE (% passing by weight)

AASHTO No. 4[1]

SEIVE	COARSE AGGREGATE (% PASSING by WEIGHT) AASHTO No. 4
2-inch	100
1 1/2-inch	90 - 100
1-inch	20 - 55
3/4-inch	0 - 15
1/2-inch	-
3/8-inch	0 - 5
No. 4	-
No. 8	-
No. 16	-
No. 30	-
No. 50	-
No. 100	-
No. 200	<=1.5

[1] Size according to AASHTO M43.

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612 Underdrains

612.3.9 Trench Underdrains

Replace paragraph one with the following effective with the November 2023 letting:

(1) Under the Underdrain Trench bid item, excavate and backfill underdrain trenches. Backfill with coarse aggregate gradation conforming to 604.2(3). Before backfilling place geotextile as the plans show.

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614 Semi-rigid Barrier Systems and End Treatments

614.2.6 Sand Barrel Arrays

Replace paragraph one with the following effective with the November 2023 letting:

(1) Furnish sand barrels from the APL. Use fine aggregate conforming to gradation shown in Table 614-2 mixed with sodium chloride conforming to AASHTO M143. Apply an object marker to front-most barrel in the array.

TABLE 614-2 FINE AGGREGATE GRADATION

SEIVE	FINE AGGREGATE (% PASSING by WEIGHT)
3/8-inch	100
No. 4	90 - 100
No. 8	-
No. 16	45 - 85
No. 30	-
No. 50	5 - 30
No. 100	0 - 10
No. 200	<=3.5

628 Erosion Control

628.2.13 Rock Bags

Replace paragraph two with the following effective with the November 2023 letting:

(2) Fill the bags with a clean, sound, hard, durable, engineer-approved coarse aggregate conforming by visual inspection to the gradation specified for coarse aggregate gradation in 604.2(3).

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639 Drilling Wells

639.2.1 General

Replace paragraph two with the following effective with the November 2023 letting:

(2) For grout use fine aggregate conforming to 501.2.7.2; and gradation conforming to 614.2.6(1); and type I, IL, IS, IP, or IT cement.

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652 Electrical Conduit

652.3.1.2 Installing Underground

Replace paragraph two with the following effective with the November 2023 letting:

(2) Excavate trenches true to line and grade to provide the conduit uniform bearing throughout its length. Do not backfill the trench before inspecting the conduit. Carefully tamp the backfill in place as specified for placing backfill in layers in 651.3. Place at least 0.7 cubic feet of coarse aggregate gradation conforming to 604.2(3) directly under each drainage hole.

ERRATA

390.3.4 Special High Early Strength Concrete Patching

Correct errata link in paragraph (1) by changing from 416.3.8 to 416.3.7.

(1) Construct as specified for special high early strength repairs under 416.3.7 except as follows:

- The contractor may delay removal for up to 14 calendar days after cutting the existing pavement.
- Open to traffic as specified for concrete base in 320.3.

ADDITIONAL SPECIAL PROVISION 7

A. Reporting 1st Tier and DBE Payments During Construction

1. Comply with reporting requirements specified in the department's Civil Rights Compliance, Contractor's User Manual, Sublets and Payments.
2. Report payments to all DBE firms within 10 calendar days of receipt of a progress payment by the department or a contractor for work performed, materials furnished, or materials stockpiled by a DBE firm. Report the payment as specified in A(1) for all work satisfactorily performed and for all materials furnished or stockpiled.
3. Report payments to all first tier subcontractor relationships within 10 calendar days of receipt of a progress payment by the department for work performed. Report the payment as specified in A(1) for all work satisfactorily performed.
4. All tiers shall report payments as necessary to comply with the DBE payment requirement as specified in A(2).
5. DBE firms must enter all payments to DBE and non-DBE firms regardless of tier.
6. Require all first tier relationships, DBE firms and all other tier relationships necessary to comply with the DBE payment requirement in receipt of a progress payment by contractor to acknowledge receipt of payment as specified in A(1), (2), (3) and (4).
7. All agreements made by a contractor shall include the provisions in A(1), (2), (3), (4), (5), and (6), and shall be binding on all first tier subcontractor relationships, all contractors and subcontractors utilizing DBE firms on the project, and all payments from DBE firms.

B. Costs for conforming to this special provision are incidental to the contract.

NOTE: CRCS Prime Contractor payment is currently not automated and will need to be manually loaded into the Civil Rights Compliance System. Copies of prime contractor payments received (check or ACH) will have to be forwarded to paul.ndon@dot.wi.gov within 5 days of payment receipt to be logged manually.

***Additionally, for information on Subcontractor Sublet assignments, Subcontractor Payments and Payment Tracking, please refer to the CRCS Payment and Sublets manual at:

https://wisconsindot.gov/Documents/doing-bus/civil-rights/labornwage/crcs-payments-sublets-manual.pdf

ADDITIONAL SPECIAL PROVISION 9

Electronic Certified Payroll or Labor Data Submittal

(1) Use the department's Civil Rights Compliance System (CRCS) to electronically submit certified payroll reports for contracts with federal funds and labor data for contracts with state funds only. Details are available online through the department's highway construction contractor information (HCCI) site on the Labor, Wages, and EEO Information page at:

https://wisconsindot.gov/Pages/doing-bus/civil-rights/labornwage/default.aspx

(2) Ensure that all tiers of subcontractors, including all trucking firms, either submit their weekly certified payroll reports (contracts with federal funds) or labor data (contracts with state funds only) electronically through CRCS. These payrolls or labor data are due within seven calendar days following the close of the payroll period. Every firm providing physical labor towards completing the project is a subcontractor under this special provision.

(3) Upon receipt of contract execution, promptly make all affected firms aware of the requirements under this special provision and arrange for them to receive CRCS training as they are about to begin their submittals. The department will provide training either in a classroom setting at one of our regional offices or by telephone. Contact Paul Ndon at (414) 438-4584 to schedule the training.

(4) The department will reject all paper submittals for information required under this special provision. All costs for conforming to this special provision are incidental to the contract.

(5) Firms wishing to export payroll/labor data from their computer system into CRCS should have their payroll coordinator contact Paul Ndon at paul.ndon@dot.wi.gov. Not every contractor's payroll system is capable of producing export files. For details, see Section 4.8 CPR Auto Submit (Data Mapping) on pages 49-50; 66-71 of the CRCS Payroll Manual at:

https://wisconsindot.gov/Documents/doing-bus/civil-rights/labornwage/crcs-payroll-manual.pdf

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Non-segregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
XI. Certification Regarding Use of Contract Funds for Lobbying
XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (*see* 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

> "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
(1) Withholding monthly progress payments;
(2) Assessing sanctions;
(3) Liquidated damages; and/or
(4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than $10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH–1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to *DBAconformance@dol.gov*. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to *DBAconformance@dol.gov*, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.* Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

3. Records and certified payrolls (29 CFR 5.5)

a. *Basic record requirements* (1) *Length of record retention.* All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) *Information required.* Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) *Additional records relating to fringe benefits.* Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) *Additional records relating to apprenticeship.* Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. *Certified payroll requirements* (1) *Frequency and method of submission.* The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) *Information required.* The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.,* the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH–347 or in any other format desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division website at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347/.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) *Statement of Compliance.* Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) *Use of Optional Form WH–347.* The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 will satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access* (1) *Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices* (1) *Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or 29 CFR part 1 or 3; or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or 29 CFR part 1 or 3.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* $31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or

d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of $150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1**. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

* * * * *

3. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

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XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)
This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

NON-DISCRIMINATION PROVISIONS

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. Non-discrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.

4. Information and Reports: The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the Federal Highway Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the Federal Highway Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:

a. Withholding payments to the contractor under the contract until the contractor complies; and/or
b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

Pertinent Non-Discrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

1. The Offeror's or Bidder's attention is called to the "Employment Practices" and "Equal Opportunity Clause" set forth in the Required Contract Provisions, FHWA 1273.
2. The goals and timetables for minority and female participation expressed in percentage terms for the contractor's aggregate work force in each trade, on all construction work in the covered area, are as follows:

Goals for Minority Participation for Each Trade:

County	%	County	%	County	%
Adams	1.7	Iowa	1.7	Polk	2.2
Ashland	1.2	Iron	1.2	Portage	0.6
Barron	0.6	Jackson	0.6	Price	0.6
Bayfield	1.2	Jefferson	7.0	Racine	8.4
Brown	1.3	Juneau	0.6	Richland	1.7
Buffalo	0.6	Kenosha	3.0	Rock	3.1
Burnett	2.2	Kewaunee	1.0	Rusk	0.6
Calumet	0.9	La Crosse	0.9	St. Croix	2.9
Chippewa	0.5	Lafayette	0.5	Sauk	1.7
Clark	0.6	Langlade	0.6	Sawyer	0.6
Columbia	1.7	Lincoln	0.6	Shawano	1.0
Crawford	0.5	Manitowoc	1.0	Sheboygan	7.0
Dane	2.2	Marathon	0.6	Taylor	0.6
Dodge	7.0	Marinette	1.0	Trempealeau	0.6
Door	1.0	Marquette	1.7	Vernon	0.6
Douglas	1.0	Menominee	1.0	Vilas	0.6
Dunn	0.6	Milwaukee	8.0	Walworth	7.0
Eau Claire	0.5	Monroe	0.6	Washburn	0.6
Florence	1.0	Oconto	1.0	Washington	8.0
Fond du Lac	1.0	Oneida	0.6	Waukesha	8.0
Forest	1.0	Outagamie	0.9	Waupaca	1.0
Grant	0.5	Ozaukee	8.0	Waushara	1.0
Green	1.7	Pepin	0.6	Winnebago	0.9
Green Lake	1.0	Pierce	2.2	Wood	0.6

Goals for female participation for each trade: 6.9%

These goals are applicable to all the contractor's construction work, (whether or not it is federal or federally assisted), performed in the covered area. If the contractor performs construction work in the geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The contractor's compliance with the Executive Order and the Regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order and the Regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within ten (10) working days of award of any construction subcontract in excess of $10,000.00 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor, employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

   As referred to in this section, the Director means:

   Director
   Office of Federal Contract Compliance Programs
   Ruess Federal Plaza
   310 W. Wisconsin Ave., Suite 1115
   Milwaukee, WI 53202

   The "Employer Identification Number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

4. As used in this notice, and in the contract resulting from solicitation, the "covered area" is the county(ies) in Wisconsin to which this proposal applies.

ADDITIONAL FEDERAL-AID PROVISIONS

NOTICE TO ALL BIDDERS

To report bid rigging activities call:

1-800-424-9071

The U.S. Department of Transportation (DOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., Eastern Time. Anyone with knowledge of possible bid rigging, bidding collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

BUY AMERICA PROVISION

Buy America (as documented in 88 FR 57750 (2 CFR part 184 and 200) from the Office of Management and Budget: Federal Register: Guidance for Grants and Agreements) shall be domestic products and permanently incorporated in this project as classified in the following three categories, and as noted in the Construction and Materials Manual (CMM):

1. Iron and Steel

   All iron and steel manufacturing and coating processes (from the initial melting stage through the application of coatings) must have occurred within the United States. Coating includes epoxy coating, galvanizing, painting and any other coating that protects or enhances the value of a material subject to the requirements of Buy America.

   The exemption of the iron and steel manufacturing and coating processes Buy America requirement is the minimal use of foreign materials if the total cost of such material permanently incorporated in the product does not exceed one-tenth of one percent (1/10 of 1%) of the total contract cost or $2,500.00, whichever is greater. For purposes of this paragraph, the cost is that shown to be the value of the subject products as they are delivered to the project.

2. Manufactured Product

   All manufactured products (as defined in CMM 228.5) are covered under a previous waiver from 1983 and are currently exempt from Buy America.

3. Construction Material

   All construction materials (as defined in 88 FR 57750 (2 CFR part 184 and 200) and as referenced in CMM 228.5) must comply with Buy America. All manufacturing process of construction materials must occur in the United States.

88 FR 55817 (DOT-OST-2022-0124) allows a limited waiver of Buy America requirements for de minimis costs and small grants.

- The Total value of the non-compliant products is no more than the lesser of $1,000,000 or 5% of total applicable costs for the project[1]; or
- The total amount of Federal financial assistance applied to the project, through awards or subaward, is below $500,000[2]

The contractor shall take actions and provide documentation conforming to CMM 228.5 to ensure compliance with this Buy America provision.

https://wisconsindot.gov/rdwy/cmm/cm-02-28.pdf

Upon completion of the project, certify to the engineer, in writing using department form DT4567 that all iron and steel, manufactured products, and construction materials conform to this Buy America provision.

Form DT4567 is available at: https://wisconsindot.gov/Documents/formdocs/dt4567.docx

Attach a list of iron or steel and construction material exemptions and their associated costs to the certification form.

1 The de minimis public interest waiver does not apply to iron and steel subject to the requirements of 23 U.S.C. 313 on financial assistant administered by FHWA. The de minimis threshold in 23 CFR 635.410(b)(4) continues to apply for iron and steel.
2 The small grant portion of the waiver does not apply to iron, steel, and manufactured goods subject to the requirements of 49 U.S.C. 22905(a).

CARGO PREFERENCE ACT REQUIREMENT

All Federal-aid projects shall comply with 46 CFR 381.7 (a) – (b) as follows:

(a) *Agreement Clauses.* "Use of United States-flag vessels:"

(1) Pursuant to Pub. L. 664 (43 U.S.C. 1241(b)) at least 50 percent of any equipment, materials or commodities procured, contracted for or otherwise obtained with funds granted, guaranteed, loaned, or advanced by the U.S. Government under this agreement, and which may be transported by ocean vessel, shall be transported on privately owned United States-flag commercial vessels, if available.

(2) Within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (a)(1) of this section shall be furnished to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590."

(b) *Contractor and Subcontractor Clauses.* "Use of United States-flag vessels: The contractor agrees—"

(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.

WISCONSIN DEPARTMENT OF TRANSPORTATION
DIVISION OF TRANSPORTATION AND SYSTEM DEVELOPMENT

SUPPLEMENTAL REQUIRED CONTRACT PROVISIONS FOR PROJECTS WITH FEDERAL AID

I. PREVAILING WAGE RATES

The attached U.S. Department of Labor (Davis-Bacon Minimum Wage Rates) furnishes the minimum prevailing wage rates pursuant to the Davis-Bacon and Related Acts. The wage rates shown are the minimum rates required by the contract to be paid during its life, however this is not a representation that labor can be obtained at these rates. Itis the responsibility of bidders to inform themselves as to the local labor conditions and prospective changes or adjustments of wage rates. No increase in the contract price will be allowed or authorized on account of the payment of wage rates in excess of those listed herein.

II. COVERAGE OF TRUCK DRIVERS

Truck drivers are covered by Davis-Bacon Minimum Wage Rates in the following circumstances:

- Drivers of a contractor or subcontractor for time spent working on the site of the work.
- Drivers of a contractor or subcontractor for time spent loading and/or unloading materials and supplies on the site of the work, if such time is not de minimis. https://www.dol.gov/whd/FOH/FOH_Ch15.pdf
- Truck drivers transporting materials or supplies between a facility that is deemed part of the site of the work and the actual construction site.
- Truck drivers transporting portions of the building or work between a site established specifically for the performance of the contract where a significant portion of such building or work is constructed and the physical place where the building or work called for in the contract will remain.

Truck drivers are not covered by Davis-Bacon Minimum Wage Rates in the following circumstances:

- Material delivery truck drivers while off the site of the work.
- Drivers of a contractor or subcontractor traveling between a Davis-Bacon job and a commercial supply facility while they are off the site of the work."
- Truck drivers whose time spent on the site of the work is de minimis, such as only a few minutes at a time merely to pick up or drop off materials or supplies.

Details are available online at:

https://www.dol.gov/whd/recovery/pwrb/Tab9.pdf

https://wisconsindot.gov/Pages/doing-bus/civil-rights/labornwage/trckng.aspx

III. POSTINGS AT THE SITE OF THE WORK

In addition to the required postings furnished by the department, the contractor shall post the following in at least one conspicuous and accessible place at the site of work:

a. A copy of the contractor's Equal Employment Opportunity Policy.

All required documents shall be posted by the first day of work and be accurate and complete. Postings must be readable, in an area where they will be noticed, and maintained until the last day of work.

IV. RESOURCES

Required information regarding compliance with federal provisions is found in the following resources:

- FHWA-1273 included in this contract
- U.S. Department of Labor Prevailing Wage Resource Book
- U.S. Department of Labor Field Operations Handbook
- U.S. Code of Federal Regulations
- Any applicable law, Act, or Executive Order enacted by the federal government at the time of the letting of this contract

"General Decision Number: WI20240010 03/15/2024

Superseded General Decision Number: WI20230010

State: Wisconsin

Construction Type: Highway

Counties: Wisconsin Statewide.

HIGHWAY, AIRPORT RUNWAY & TAXIWAY CONSTRUCTION PROJECTS (does not include bridges over navigable waters; tunnels; buildings in highway rest areas; and railroad construction)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2024

1	01/26/2024
2	02/02/2024
3	02/16/2024
4	03/15/2024

BRWI0001-002 06/01/2023

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.18	25.88

BRWI0002-002 06/01/2023

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 47.10	25.16

BRWI0002-005 06/01/2023

ADAMS, ASHLAND, BARRON, BROWN, BURNETT, CALUMET, CHIPPEWA, CLARK, COLUMBIA, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, IRON, JEFFERSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA, OUTAGAMIE, POLK, PORTAGE, RUSK, ST CROIX, SAUK, SHAWANO, SHEBOYGAN, TAYLOR, VILAS, WALWORTH, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 39.97	25.02

BRWI0003-002 06/01/2023

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.00	26.06

BRWI0004-002 06/01/2023

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.50	26.96

BRWI0006-002 06/01/2023

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.08	25.98

BRWI0007-002 06/01/2023

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.95	26.80

BRWI0008-002 06/05/2023

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.96	25.67

BRWI0011-002 06/01/2023

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.00	26.06

BRWI0019-002 06/01/2023

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.32	26.74

BRWI0034-002 06/01/2023

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.56	26.19

CARP0068-011 05/02/2022

BURNETT (W. of Hwy 48), PIERCE (W. of Hwy 29), POLK (W. of Hwys 35, 48 & 65), AND ST. CROIX (W. of Hwy 65) COUNTIES

	Rates	Fringes
Carpenter & Piledrivermen	$ 41.19	27.05

CARP0264-003 06/05/2023

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WAUKESHA, AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER	$ 41.91	29.72

CARP0310-002 06/05/2023

ADAMS, ASHLAND, BAYFIELD (Eastern 2/3), FOREST, IRON, JUNEAU, LANGLADE, LINCOLN, MARATHON, ONEIDA, PORTAGE, PRICE, SHAWANO

(Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes
CARPENTER	$ 38.86	27.06
Piledriver	$ 39.43	27.02

CARP0314-001 06/05/2023

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, ROCK, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
CARPENTER	$ 38.86	27.06
Piledriver	$ 39.43	27.02

CARP0361-004 05/01/2018

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 36.15	20.43

CARP0731-002 06/05/2023

CALUMET (Eastern Portion of the County), FOND DU LAC (Eastern Portion of the County), MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
CARPENTER	$ 38.86	27.06
Piledriver	$ 39.43	27.02

CARP0955-002 06/05/2023

CALUMET (Western Portion of the County), FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, OUTAGAMIE, WAUPACA, WAUSHARA, AND WINNEBAGO

	Rates	Fringes
CARPENTER	$ 38.86	27.06
PILEDRIVER	$ 39.43	27.02

CARP1056-002 06/01/2023

ADAMS, ASHLAND, BARRON, BAYFIELD , BROWN, BUFFALO, BURNETT ,CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST. CROIX (E. of Hwy. 65), TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 40.00	27.77

CARP1074-002 06/05/2023

BARRON, BURNETT, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), RUSK, SAWYER, ST. CROIX (E. of Hwy. 65), AND WASHBURN

	Rates	Fringes
CARPENTER	$ 38.86	27.06
PILEDRIVER	$ 39.43	27.02

CARP1143-002 06/05/2023

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPEALEAU AND VERNON COUNTIES

	Rates	Fringes
CARPENTER	$ 38.86	27.06
PILEDRIVER	$ 39.43	27.02

CARP1146-002 06/05/2023

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
CARPENTER	$ 38.86	27.06
PILEDRIVER	$ 39.43	27.02

CARP2337-009 06/05/2023

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
PILEDRIVERMAN	$ 39.22	34.01

ELEC0014-002 11/26/2023

ASHLAND, BARRON, BAYFIELD, BUFFALO, BURNETT, CHIPPEWA, CLARK (except Maryville, Colby, Unity, Sherman, Fremont, Lynn & Sherwood), CRAWFORD, DUNN, EAU CLAIRE, GRANT, IRON, JACKSON, LA CROSSE, MONROE, PEPIN, PIERCE, POLK, PRICE, RICHLAND, RUSK, ST CROIX, SAWYER, TAYLOR, TREMPEALEAU, VERNON, AND WASHBURN COUNTIES

	Rates	Fringes
Electricians:	$ 41.32	22.91

ELEC0014-007 05/28/2023

REMAINING COUNTIES

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 29.82	17.70

Low voltage construction, installation, maintenance and removal of teledata facilities (voice, data, and video) including outside plant, telephone and data inside wire, interconnect, terminal equipment, central offices, PABX, fiber optic cable and equipment, micro waves, V-SAT, bypass, CATV, WAN (wide area networks), LAN (local area networks), and ISDN (integrated systems digital network).

ELEC0127-002 06/01/2023

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 46.05	30%+13.15

ELEC0158-002 05/30/2021

BROWN, DOOR, KEWAUNEE, MANITOWOC (except Schleswig), MARINETTE(Wausuakee and area South thereof), OCONTO, MENOMINEE (East of a ine 6 miles West of the West boundary of Oconto County), SHAWANO (Except Area North of Townships of Aniwa and Hutchins) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 36.14	29.75%+10.26

ELEC0159-003 05/30/2021

COLUMBIA, DANE, DODGE (Area West of Hwy 26, except Chester and Emmet Townships), GREEN, LAKE (except Townships of Berlin, Seneca, and St. Marie), IOWA, MARQUETTE (except Townships of Neshkoka, Crystal Lake, Newton, and Springfield), and SAUK COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 43.38	23.13

ELEC0219-004 06/01/2019

FLORENCE COUNTY (Townships of Aurora, Commonwealth, Fern, Florence and Homestead) AND MARINETTE COUNTY (Township of Niagara)

	Rates	Fringes
Electricians:		
Electrical contracts over $180,000	$ 33.94	21.80
Electrical contracts under $180,000	$ 31.75	21.73

ELEC0242-005 05/30/2021

DOUGLAS COUNTY

	Rates	Fringes
Electricians:	$ 41.37	69.25%

ELEC0388-002 06/01/2023

ADAMS, CLARK (Colby, Freemont, Lynn, Mayville, Sherman, Sherwood, Unity), FOREST, JUNEAU, LANGLADE, LINCOLN, MARATHON, MARINETTE (Beecher, Dunbar, Goodman & Pembine), MENOMINEE (Area West of a line 6 miles West of the West boundary of Oconto County), ONEIDA, PORTAGE, SHAWANO (Aniwa and Hutchins), VILAS AND WOOD COUNTIES

	Rates	Fringes
Electricians:	$ 38.74	26%+11.76

ELEC0430-002 06/01/2023

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 46.70	25.02

ELEC0494-005 05/28/2023

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 47.75	26.72

ELEC0494-006 05/28/2023

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 41.40	23.90

ELEC0494-013 05/28/2023

DODGE (East of Hwy 26 including Chester Twp, excluding Emmet Twp), FOND DU LAC (Except Waupuin), MILWAUKEE, OZAUKEE, MANITOWOC (Schleswig), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Sound & Communications		
Installer:	$ 34.65	18.36
Technician:	$ 34.65	18.36

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and

low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

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* ELEC0577-003 06/01/2023

CALUMET (except Township of New Holstein), GREEN LAKE (N. part including Townships of Berlin, St Marie, and Seneca), MARQUETTE (N. part including Townships of Crystal Lake, Neshkoro, Newton, and Springfield), OUTAGAMIE, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
Electricians:	$ 38.94	29.50%+10.00

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* ELEC0890-003 06/01/2023

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 42.25	25.95%+11.63

ELEC0953-001 06/02/2019

	Rates	Fringes
Line Construction:		
(1) Lineman	$ 47.53	21.43
(2) Heavy Equipment Operator	$ 42.78	19.80
(3) Equipment Operator	$ 38.02	18.40
(4) Heavy Groundman Driver	$ 33.27	16.88
(5) Light Groundman Driver	$ 30.89	16.11
(6) Groundsman	$ 26.14	14.60

ENGI0139-005 06/01/2023

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 43.77	27.40
Group 2	$ 43.27	27.40
Group 3	$ 42.77	27.40
Group 4	$ 42.51	27.40
Group 5	$ 42.22	27.40
Group 6	$ 36.32	27.40

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" protection - $3.00 per hour

EPA Level ""B"" protection - $2.00 per hour
EPA Level ""C"" protection - $1.00 per hour

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, tower cranes, and derricks with or without attachments with a lifting capacity of over 100 tons; or cranes, tower cranes, and derricks with boom, leads and/or jib lengths measuring 176 feet or longer.

GROUP 2: Cranes, tower cranes and derricks with or without attachments with a lifting capacity of 100 tons or less; or cranes, tower cranes, and derricks with boom, leads, and/or jibs lengths measuring 175 feet or under and Backhoes (excavators) weighing 130,000 lbs and over; caisson rigs; pile driver; dredge operator; dredge engineer; Boat Pilot.

GROUP 3: Mechanic or welder - Heavy duty equipment; cranes with a lifting capacity of 25 tons or under; concrete breaker (manual or remote); vibratory/sonic concrete breaker; concrete laser screed; concrete slipform paver; concrete batch plant operator; concrete pvt. spreader - heavy duty (rubber tired); concrete spreader & distributor; automatic subgrader (concrete); concrete grinder & planing machine; concrete slipform curb & gutter machine; slipform concrete placer; tube finisher; hydro blaster (10,000 psi & over); bridge paver; concrete conveyor system; concrete pump; Rotec type Conveyor; stabilizing mixer (self-propelled); shoulder widener; asphalt plant engineer; bituminious paver; bump cutter & grooving machine; milling machine; screed (bituminous paver); asphalt heater, planer & scarifier; Backhoes (excavators) weighing under 130,000 lbs; grader or motor patrol; tractor (scraper, dozer, pusher, loader); scraper - rubber tired (single or twin engine); endloader; hydraulic backhoe (tractor type); trenching machine; skid rigs; tractor, side boom (heavy); drilling or boring machine (mechanical heavy); roller over 5 tons; percussion or rotary drilling machine; air track; blaster; loading machine (conveyor); tugger; boatmen; winches & A-frames; post driver; material hoist.

GROUP 4: Greaser, roller steel (5 tons or less); roller (pneumatic tired) - self propelled; tractor (mounted or towed compactors & light equipment); shouldering machine; self- propelled chip spreader; concrete spreader; finishing machine; mechanical float; curing machine; power subgrader; joint sawer (multiple blade) belting machine; burlap machine; texturing machine; tractor endloader (rubber tired) - light; jeep digger; forklift; mulcher; launch operator; fireman, environmental burner

GROUP 5: Air compressor; power pack; vibrator hammer and extractor; heavy equipment, leadman; tank car heaters; stump chipper; curb machine operator; Concrete proportioning plants; generators; mudjack operator; rock breaker; crusher or screening plant; screed (milling machine); automatic belt conveyor and surge bin; pug mill operator; Oiler, pump (over 3 inches); Drilling Machine Tender, day light machine

GROUP 6: Off-road material hauler with or without ejector.

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 43.40	30.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2023

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 41.73	30.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/01/2023

ADAMS, COLUMBIA, CRAWFORD, DANE, DODGE, FLORENCE, FOREST, GRANT, GREENE, (Excluding S.E. tip), GREEN LAKE, IOWA, JEFFERSON, JUNEAU, LA CROSSE, LAFAYETTE, LANGLADE, MARATHON, MARQUETTE, MENOMINEE, MONROE, PORTAGE, RICHLAND, ROCK (Northern area, vicinity of Edgerton and Milton), SAUK, VERNON, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
IRONWORKER	$ 41.00	30.13

IRON0498-005 06/01/2023

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 45.18	47.08

IRON0512-008 04/30/2023

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 43.00	34.11

IRON0512-021 04/30/2023

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA,

PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 39.14	34.00

LABO0113-002 06/01/2023

MILWAUKEE AND WAUKESHA COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 33.56	23.86
Group 2	$ 33.71	23.86
Group 3	$ 33.91	23.86
Group 4	$ 34.06	23.86
Group 5	$ 34.21	23.86
Group 6	$ 30.05	23.86

LABORERS CLASSIFICATIONS

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler; Stone Handler; Bituminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminous Worker (Dumper, Ironer, Smoother, and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated); Chain Saw Operator; Demolition Burning Torch Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster and Powderman

GROUP 6: Flagperson; traffic control person

LABO0113-003 06/01/2023

OZAUKEE AND WASHINGTON COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 32.81	23.86
Group 2	$ 32.91	23.86
Group 3	$ 32.96	23.86
Group 4	$ 33.16	23.86
Group 5	$ 33.01	23.86
Group 6	$ 29.90	23.86

LABORERS CLASSIFICATIONS

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler;

Stone Handler; Bituminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminous Worker (Dumper, Ironer, Smoother, and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated);

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster; powderman

GROUP 6: Flagperson and Traffic Control Person

LABO0113-011 06/01/2023

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 32.62	23.86
Group 2	$ 32.77	23.86
Group 3	$ 32.97	23.86
Group 4	$ 32.94	23.86
Group 5	$ 33.27	23.86
Group 6	$ 29.76	23.86

LABORERS CLASSIFICATIONS:

GROUP 1: General laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler; Stone Handler; Bituminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminous worker (Dumper, Ironer, Smoother, and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated); Chain Saw Operator; Demolition Burning Torch Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster and Powderman

GROUP 6: Flagman; traffic control person

LABO0140-002 06/01/2023

ADAMS, ASHLAND, BARRON, BAYFIELD, BROWN, BUFFALO, BURNETT, CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DOUGLAS, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IRON, JACKSON, JUNEAU, IOWA, JEFFERSON, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN,

MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST. CROIX, TAYLOR, TREMPEALEAU, VERNON, VILLAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 37.57	19.25
Group 2	$ 37.67	19.25
Group 3	$ 37.72	19.25
Group 4	$ 37.92	19.25
Group 5	$ 37.77	19.25
Group 6	$ 34.20	19.25

LABORER CLASSIFICATIONS

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler; Stone Handler; Bitminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminous Worker (Dumper, Ironer, Smoother and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated); Chain Saw Operator, Demolition Burning Torch Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk and Pavement); Strike Off Man

GROUP 4: Line and Grade Secialist

GROUP 5: Blaster; powderman

GROUP 6: Flagperson; Traffic Control

LABO0464-003 06/01/2023

DANE COUNTY

	Rates	Fringes
LABORER		
Group 1	$ 37.85	19.25
Group 2	$ 37.95	19.25
Group 3	$ 38.00	19.25
Group 4	$ 38.20	19.25
Group 5	$ 38.05	19.25
Group 6	$ 34.20	19.25

LABORERS CLASSIFICATIONS:

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler; Stone Handler; Bituminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminious Worker (Dumper, Ironer, Smoother, and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated); Chain Saw Operator; Demolition Burning Torch Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster; Powderman

GROUP 6: Flagperson and Traffic Control Person

PAIN0106-008 05/01/2023

ASHLAND, BAYFIELD, BURNETT, AND DOUGLAS COUNTIES

	Rates	Fringes
Painters:		
New:		
Brush, Roller	$ 34.59	24.84
Spray, Sandblast, Steel	$ 35.19	24.84
Repaint:		
Brush, Roller	$ 33.09	24.84
Spray, Sandblast, Steel	$ 33.69	24.84

PAIN0108-002 06/01/2023

RACINE COUNTY

	Rates	Fringes
Painters:		
Brush, Roller	$ 41.04	21.95
Spray & Sandblast	$ 42.04	21.95

PAIN0259-002 05/01/2008

BARRON, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, SAWYER, ST. CROIX, AND WASHBURN COUNTIES

	Rates	Fringes
PAINTER	$ 24.11	12.15

PAIN0259-004 05/01/2015

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
PAINTER	$ 22.03	12.45

PAIN0781-002 06/01/2023

JEFFERSON, MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes

Painters:
     Bridge.....$ 39.84 24.86
     Brush.....$ 39.09 24.86
     Spray & Sandblast.....$ 39.84 24.86

PAIN0802-002 06/01/2023

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, LAFAYETTE, RICHLAND, ROCK, AND SAUK COUNTIES

	Rates	Fringes
PAINTER		
Brush	$ 35.00	20.62

PREMIUM PAY:
  Structural Steel, Spray, Bridges = $1.00 additional per hour.

PAIN0802-003 06/01/2023

ADAMS, BROWN, CALUMET, CLARK, DOOR, FOND DU LAC, FOREST, GREEN LAKE, IRON, JUNEAU, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA, OUTAGAMIE, PORTAGE, PRICE, SHAWANO, SHEBOYGAN, TAYLOR, VILAS, WAUSHARA, WAUPACA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
PAINTER	$ 35.00	20.62

PAIN0934-001 06/01/2022

KENOSHA AND WALWORTH COUNTIES

	Rates	Fringes
Painters:		
Brush	$ 36.70	24.69
Spray	$ 37.70	24.69
Structural Steel	$ 36.85	24.69

PAIN1011-002 06/06/2021

FLORENCE COUNTY

	Rates	Fringes
Painters:	$ 26.71	14.38

PLAS0599-002 06/01/2023

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area A	$ 45.17	27.27
Area B	$ 39.97	25.02
Area C	$ 40.40	25.25
Area D	$ 41.16	24.49
Area E	$ 40.50	25.14
Area F	$ 36.98	28.67

AREA DESCRIPTIONS

AREA A: ASHLAND, BURNETT, BAYFIELD, DOUGLAS, IRON, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA B: ADAMS, BARRON, BROWN, CALUMET, CHIPPEWA, CLARK, COLUMBIA, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, JEFFERSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA, OUTAGAMIE, POLK, PORTAGE, RUSK, ST. CROIX, SAUK, SHAWANO, SHEBOYGAN, TAYLOR, VILAS, WALWORTH, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

AREA C: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE, MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA D: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA E: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA F: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2023

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 35.57	26.09
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 35.72	26.09

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

"General Decision Number: WI20240011 03/15/2024

Superseded General Decision Number: WI20230011

State: Wisconsin

Construction Type: Building

Counties: Adams, Ashland, Barron, Bayfield, Buffalo, Burnett, Clark, Columbia, Crawford, Dodge, Door, Dunn, Florence, Fond Du Lac, Forest, Grant, Green, Green Lake, Iowa, Iron, Jackson, Jefferson, Juneau, Kewaunee, Lafayette, Langlade, Lincoln, Manitowoc, Marinette, Marquette, Menominee, Monroe, Oconto, Oneida, Pepin, Polk, Portage, Price, Richland, Rusk, Sauk, Sawyer, Shawano, Taylor, Trempealeau, Vernon, Vilas, Walworth, Washburn, Waupaca, Waushara and Wood Counties in Wisconsin.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2024
1	01/26/2024
2	02/02/2024
3	02/16/2024
4	03/15/2024

ASBE0019-002 06/01/2023

COLUMBIA, CRAWFORD, DODGE, GRANT, GREEN, IOWA, JEFFERSON, JUNEAU, LAFAYETTE, MARQUETTE, MONROE, RICHLAND, SAUK, VERNON, AND WALWORTH COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 42.80	36.10

ASBE0034-005 06/12/2023

BARRON, BUFFALO, DUNN, PEPIN, AND POLK COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials; protective coatings, coverings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 41.50	38.17

ASBE0049-003 06/01/2023

ASHLAND, BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of		

all insulating materials;
protective coverings,
coatings, and finishes to all
types of mechanical systems.
Includes preparation,
wetting, stripping, removal,
scrapping, vacuuming, bagging
and disposing of all
insulation materials from
mechanical systems whether
they contain asbestos or not)....$ 37.62 29.00

ASBE0127-002 12/02/2023

ADAMS, CLARK, DOOR, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE,
JACKSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARINETTE,
MENOMINEE, OCONTO, ONEIDA, PORTAGE, PRICE, RUSK, SHAWANO,
TAYLOR, TREMPEALEAU, VILAS, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
Heat and Frost Insulator (Includes the application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems; and the application of firestopping material in walls, floors, ceilings. Includes preparation, wetting, stripping, removal, scrapping vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)....	$ 39.59	28.21

BOIL0107-001 01/01/2021

	Rates	Fringes
BOILERMAKER		
Boilermaker.....	$ 39.52	31.50
Small Boiler Repair (under 25,000 lbs/hr).....	$ 26.91	16.00

BRWI0001-003 06/01/2023

CRAWFORD,JUNEAU, MONROE,TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
Bricklayer & Tile Setter.....	$ 40.18	25.88

BRWI0002-003 06/01/2023

ASHLAND, BURNETT, IRON, WASHBURN

	Rates	Fringes
BRICKLAYER		
Bricklayer, Tile Setter.....	$ 47.10	25.16
Cement Mason/Concrete		

Finisher	$ 44.75	25.16

BRWI0002-004 06/01/2023

BAYFIELD COUNTY

	Rates	Fringes
BRICKLAYER		
Bricklayer & Tile Setter	$ 47.10	25.16

BRWI0003-001 06/01/2023

DOOR, KEWAUNEE, FLORENCE, FOND DU LAC, GREEN LAKE, MANITOWOC, MARINETTE, MARQUETTE, OCONTO, SHAWANO, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Setter	$ 40.00	26.06

BRWI0004-003 06/01/2023

WALWORTH COUNTY

	Rates	Fringes
BRICKLAYER	$ 44.50	26.96
CEMENT MASON/CONCRETE FINISHER	$ 40.16	26.96
TILE SETTER	$ 37.29	26.96

BRWI0006-001 06/01/2023

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MENOMINEE, ONEIDA, PORTAGE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer,Cement Mason,Tile Setter	$ 40.08	25.98

BRWI0006-004 06/01/2023

PRICE COUNTY

	Rates	Fringes
Bricklayer & Tile Setter	$ 40.08	25.98

BRWI0007-003 06/01/2023

GREEN AND LAFAYETTE COUNTIES

	Rates	Fringes
Bricklayer & Tile Setter	$ 40.95	26.80

BRWI0013-003 06/01/2023

GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
Bricklayer	$ 41.56	26.19
Tile Layer	$ 38.40	25.66

BRWI0019-004 06/01/2023

BARRON, BURNETT (Southern half), DUNN, PEPIN, POLK, RUSK, AND WASHBURN (Southern half) COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 39.32	26.74

BRWI0019-005 06/01/2023

SAWYER COUNTY

	Rates	Fringes
Bricklayer & Tile Setter	$ 39.32	26.74

BRWI0021-001 06/01/2023

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 40.49	27.24

BRWI0034-001 06/01/2023

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 41.56	26.19

CARP0068-013 05/02/2022

BURNETT (West of highway 48) AND POLK(West of Highways 35, 48 & 65) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work)	$ 41.51	27.32

CARP0310-007 06/05/2023

ADAMS, BAYFIELD (Eastern 2/3), FOREST, IRON, ONEIDA, PORTAGE, PRICE, SHAWANO (Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes

CARPENTER (Including Drywall
Hanging, Acoustical Work).....$ 38.86 27.06
Piledriverman.....$ 39.43 27.02

CARP0310-008 06/01/2023

ASHLAND COUNTY

	Rates	Fringes
CABINET INSTALLER (Including Drywall Hanging & Acoustical Work).....$	38.86	27.06

CARP0314-006 06/05/2023

COLUMBIA, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work).....$	38.86	27.06
Piledriverman.....$	39.43	27.02

CARP0361-006 05/03/2021

BAYFIELD COUNTY (West of Hwy 63)

	Rates	Fringes
Carpenters: (Including Drywall Hanging, Acoustical work).....$	39.71	26.01

CARP0731-006 06/05/2023

FOND DU LAC (Eastern Portion of the County) AND MANITOWOC COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work).....$	38.86	27.06
Piledriverman.....$	39.43	27.02

CARP0955-004 06/05/2023

FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work).....$	38.86	27.06
Piledriverman.....$	39.43	27.02

CARP1056-004 06/01/2023

ADAMS, ASHLAND, BARRON, BAYFIELD (Eastern 2/3), BUFFALO, BURNETT, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DUNN,

FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, PEPIN, POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, RUSK, SAUK, SAWYER, SHAWANO, TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 40.00	27.77

CARP1074-009 06/05/2023

BARRON, BURNETT (East of Hwy 48), CLARK, DUNN, POLK (East of Hwy 35, 48, 65), RUSK, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 38.86	27.06
Piledriverman	$ 39.43	27.02

CARP1143-006 06/05/2023

BUFALO, CRAWFORD, JACKSON, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 38.86	27.06
Piledriverman	$ 39.43	27.02

CARP1146-006 06/05/2023

DOOR, FLORENCE (Except area bordering Michigan), KEWAUNEE, MARINETTE (Except N.E. corner), MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 38.86	27.06
Piledriverman	$ 39.43	27.02

CARP1348-006 05/01/2020

BAYFIELD COUNTY (Western 1/3)

	Rates	Fringes
MILLWRIGHT	$ 35.75	21.30

ELEC0014-001 11/26/2023

ASHLAND, BARRON, BAYFIELD, BUFFALO, BURNETT, CHIPPEWA, CLARK (Except Colby, Fremont, Lynn, Maryville, Sherman, Sherwood, Unity), CRAWFORD, DUNN, GRANT, IRON, JACKSON, MONROE, PEPIN, POLK, PRICE, RICHLAND, RUSK, SAWYER, TAYLOR, TREMPEALEAU, VERNON, AND WASHBURN COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 41.32	22.91

ELEC0014-005 05/28/2023

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 29.82	17.70

Low voltage construction, installation, maintenance and removal of teledata facilities (voice, data, and video) including outside plant, telephone and data inside wire, interconnect, terminal equipment, central offices, PABX, fiber optic cable and equipment, micro waves, V-SAT, bypass, CATV, WAN (wide area networks), LAN (local area networks), and ISDN (integrated systems digital network).

ELEC0158-007 05/30/2021

DOOR, KEWAUNEE, MANITOWOC (except Schleswig), MARINETTE(Wausuakee and area South thereof), OCONTO, MENOMINEE (East of a ine 6 miles West of the West boundary of Oconto County), SHAWANO (Except Area North of Townships of Aniwa and Hutchins) COUNTIES

	Rates	Fringes
Electricians:	$ 36.14	29.75%+10.26

ELEC0159-001 05/30/2021

COLUMBIA, DODGE (West of Hwy 26 except Chester and Emmet Twps), GREEN LAKE COUNTY (Except Townships of Berlin, Seneca & St. Marie), IOWA, MARQUETTE COUNTY (Except Townships of Neshkoka, Crystal Lake, Newton, and Springfield), AND SAUK COUNTIES

	Rates	Fringes
Electricians:	$ 43.38	23.13

ELEC0219-006 06/01/2019

FLORENCE COUNTY (Townships of Aurora, Commonwealth, Fern, Florence and Homestead) AND MARINETTE COUNTY (Township of Niagara)

	Rates	Fringes
ELECTRICIAN		
Electrical contracts over $180,000	$ 33.94	21.80
Electrical contracts under $180,000	$ 31.75	21.73

ELEC0388-004 06/01/2023

ADAMS, CLARK (Colby, Freemont, Lynn, Mayville, Sherman,

Sherwood, Unity), FOREST, JUNEAU, LANGLADE, LINCOLN, MARINETTE (Beecher, Dunbar, Goodman & Pembine), MENOMINEE (Area West of a line 6 miles West of the West boundary of Oconto County), ONEIDA, PORTAGE, SHAWANO (Aniwa and Hutchins), VILAS AND WOOD COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 38.74	26%+11.76

ELEC0494-010 05/28/2023

DODGE COUNTY (Area East of Hwy 26 including all of Chester Township, but excluding Emmet Township), FOND DU LAC (except Waupun), AND MANITOWOC (Schleswig) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 41.40	23.90

ELEC0494-014 05/28/2023

DODGE (Area East of Hwy 26 including Chester Twp but excluding Emmet Twp), FOND DU LAC (Except Waupun), AND MANITOWOC (Schleswig) COUNTIES

	Rates	Fringes
Sound & Communications		
Installer	$ 34.65	18.36
Technician	$ 34.65	18.36

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

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* ELEC0577-001 06/01/2023

GREEN LAKE (N. Part including Twps of Berlin, St Marie, and Seneca), MARQUETTE (N. part including Twps of Crystal Lake, Neshkoro, Newton, and Springfield), WAUPACA, AND WAUSHARA COUNTIES,

	Rates	Fringes

ELECTRICIAN.....$ 38.94 29.50%+10.00

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* ELEC0890-005 06/01/2023

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, AND WALWORTH COUNTIES

	Rates	Fringes
ELECTRICIAN.....	$ 42.25	25.95%+11.63

ENGI0139-004 06/05/2023

	Rates	Fringes
OPERATOR: Power Equipment		
(1) Cranes, Tower Cranes with or w/o attachments over 100 tons; Cranes, tower Cranes with boom, leads and or jib length 176 ft or longer.....	$ 47.53	25.89
(2) Cranes, Tower Cranes with or w/o attachments 100 tons or less; Cranes, Tower Cranes with boom, leads, and or jib lengths 175 ft or less.....	$ 46.28	25.89
(3) Travelling Crane (bridge type).....	$ 43.23	25.89
(4) Hydraulic Crane, 10 tons or less.....	$ 42.70	25.89
(6) Forklift.....	$ 39.10	25.89

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

IRON0008-012 06/01/2023

CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO AND WALWORTH (Northeastern part) COUNTIES

	Rates	Fringes
IRONWORKER.....	$ 43.40	30.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-004 06/01/2023

ADAMS, COLUMBIA, CRAWFORD, DODGE, FLORENCE, FOREST, GRANT, GREENE (Except S.E. tip), GREEN LAKE, IOWA, JEFFERSON, JUNEAU, LAFAYETTE, LANGLADE, MARATHON, MARQUETTE, MENOMINEE, MONROE, PORTAGE, RICHLAND, SAUK, VERNON, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
IRONWORKER	$ 41.00	30.13

IRON0498-007 06/01/2023

GREEN (S.E. 1/3) AND WALWORTH (Except N.E. part) COUNTIES

	Rates	Fringes
IRONWORKER	$ 45.18	47.08

IRON0512-009 04/30/2023

BARRON, BUFFALO, CLARK, DUNN, JACKSON, PEPIN, POLK, RUSK, TAYLOR AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 43.00	34.11

IRON0512-023 04/30/2023

ASHLAND, BAYFIELD, BURNETT, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 39.14	34.11

LABO0140-003 06/05/2023

BUFFALO, CRAWFORD, GRANT, JACKSON, JUNEAU, MONROE, RICHLAND, TREMPEALEAU (Southern part), AND VERNON COUNTIES

	Rates	Fringes
Laborer, General	$ 34.60	19.25
Laborer: Asbestos/hazardous material remover (Preparation, Removal and Encapsulation of Hazardous Materials from Non-Mechanical Systems)	$ 33.55	19.25

NOTE: Mason Tender $1.00 over general laborer scale; Pipelayer $1.00 over general laborer scale

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LABO0268-001 06/05/2023

AREA 1: BARRON, CLARK (West 1/3), DUNN, PEPIN, POLK, RUSK TAYLOR (West 1/3)

AREA 2: CLARK (East 2/3), LANGLADE, LINCOLN, ONEIDA, PRICE, TAYLOR (East 2/3), VILAS, WOOD

AREA 3: BURNETT, IRON, SAWYER, WASHBURN

	Rates	Fringes

Laborer, General
Area 1.....$ 34.60 19.25
Area 2.....$ 33.95 19.25
Area 3.....$ 33.25 19.25
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)
Area 1.....$ 33.55 19.25
Area 2.....$ 33.55 19.25
Area 3.....$ 33.55 19.25

NOTE: Mason Tender $1.00 over general laborer. Burnett, Iron, Sawyer & Washburn $.70 over general laborer.

LABO0330-001 06/01/2023

DODGE, DOOR, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, KEWAUNEE, MANITOWOC, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, PORTAGE, SHAWANO, WAUPACA,WAUSHARA

	Rates	Fringes
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 33.55	19.25
Laborers, General	$ 33.95	19.25

NOTE: Mason Tender $1.00 over general laborer.

LABO0464-005 06/05/2023

ADAMS, COLUMBIA, GREEN, JEFFERSON, LAFAYETTE, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Laborer, General		
Adams County	$ 33.95	19.25
Remaining Area	$ 34.60	19.25
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous Materials from Non-mechanical Systems)		
Adams County	$ 33.55	19.25
Remaining Area	$ 33.55	19.25

LABO0464-008 06/01/2023

	Rates	Fringes
Landscape Laborer	$ 19.72	17.84

LABO1091-001 06/01/2023

BAYFIELD (West of County Trunk A including the Iron River National Fish Hatchery and Great Lakes Transmission Co., Station 6) COUNTY

	Rates	Fringes
Laborer, General	$ 31.74	22.55
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 33.55	19.25

LABO1091-002 06/01/2023

ASHLAND & BAYFIELD (East of County Trunk A exclusive of the Iron River National Fish Hatchery and Great Lakes Transmission Co., Station 6) COUNTIES

	Rates	Fringes
Laborer, General	$ 30.29	22.55
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 33.55	19.25

PLAS0599-003 06/04/2023

PEPIN COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 36.04	25.80
PLASTERER	$ 39.26	23.92

PLAS0599-007 06/04/2023

BUFFALO, CRAWFORD, JACKSON, JUNEAU, MONROE, POLK, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 36.04	25.80
PLASTERER	$ 39.26	23.92

PLAS0599-011 06/05/2023

GRANT, GREEN, IOWA, AND LAFAYETTE COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 42.07	24.59
PLASTERER	$ 39.98	25.81

PLAS0633-046 06/01/2023

BAYFIELD, PRICE, AND SAWYER COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 45.17	22.13
PLASTERER	$ 38.24	23.23

PLUM0011-009 05/01/2023

ASHLAND BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 47.52	25.78

PLUM0075-006 06/01/2021

DODGE (Watertown), GREEN, JEFFERSON, AND LAFAYETTE COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC work)	$ 48.50	25.29

PLUM0075-008 06/01/2021

COLUMBIA, IOWA, MARQUETTE, RICHLAND, AND SAUK COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC work)	$ 48.50	25.29

PLUM0118-003 06/01/2023

WALWORTH COUNTY

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 50.50	25.47

PLUM0400-002 06/04/2018

ADAMS, CALUMET, DODGE (Except Watertown), DOOR, FOND DU LAC, GREEN LAKE, KEWAUNEE, MANITOWOC, MARINETTE (Except Niagara), MENOMINEE, OCONTO, OUTAGAMIE, SHAWANO, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)		
(1) Small buildings (except industrial and power plants) where plumbing or heating is $50,000 or less	$ 32.15	17.57
(2) All other work	$ 36.74	19.06

PLUM0434-004 05/28/2023

BARRON, BUFFALO, CLARK, CRAWFORD, DUNN, FLORENCE, FOREST, GRANT, JACKSON, JUNEAU, LANGLADE, LINCOLN, MONROE, ONEIDA, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RUSK, TAYLOR, TREMPEALEAU, VERNON, VILAS, AND WOOD COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 46.89	22.73

PLUM0601-006 06/01/2022

DODGE (Watertown), GREEN, JEFFERSON, AND LAFAYETTE COUNTIES

	Rates	Fringes
PIPEFITTER (Including HVAC work)	$ 50.00	28.93

PLUM0601-008 06/01/2022

COLUMBIA, IOWA, MARQUETTE, RICHLAND, AND SAUK COUNTIES

	Rates	Fringes
PIPEFITTER (Including HVAC work)	$ 52.06	26.86

SHEE0010-031 05/01/2008

ASHLAND, BAYFIELD AND IRON COUNTIES

	Rates	Fringes
SHEET METAL WORKER	$ 27.53	14.61

SHEE0018-003 06/01/2023

FOND DU LAC AND MANITOWOC COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 39.01	31.07

SHEE0018-004 06/01/2023

ADAMS, DOOR, FLORENCE, FOREST, GREEN LAKE, KEWAUNEE, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, SHAWANO, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 42.47	28.85

SHEE0018-014 06/01/2023

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 53.03	28.58

SHEE0018-015 09/01/2023

WALWORTH COUNTY

	Rates	Fringes
SHEET METAL WORKER (Including HVAC work)	$ 43.24	37.34

SHEE0018-017 06/01/2023

GREEN COUNTY

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 44.20	36.16

SHEE0018-018 05/29/2023

LANGLADE, LINCOLN, ONEIDA, PORTAGE, AND WOOD COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)		
Contracts $120,000 or less	$ 38.80	30.13
Contracts over $120,000	$ 38.80	30.13

SHEE0018-022 06/01/2023

BARRON, BUFFALO, BURNETT, CLARK, DUNN, JACKSON, PEPIN, POLK, PRICE, RUSK, SAWYER, TAYLOR, TREMPEALEAU, AND WASHBURN COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 38.50	30.67

SHEE0018-023 05/29/2023

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 44.32	32.15

SHEE0018-024 06/01/2023

CRAWFORD, GRANT, JUNEAU, MONROE, RICHLAND, AND VERNON COUNTIES

	Rates	Fringes
SHEET METAL WORKER (Including HVAC work)	$ 39.84	29.19

TEAM0346-003 05/01/2023

ASHLAND, BAYFIELD, BURNETT, SAWYER & WASHINGTON COUNTIES

	Rates	Fringes
TRUCK DRIVER		
2 Axle Trucks	$ 33.95	21.58

TEAM0662-002 06/01/2023

ADAMS, BARRON, BUFFALO, CLARK , DOOR, DUNN, JACKSON, JUNEAU, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MENOMINEE, OCONTO, ONEIDA, PEPIN, POLK, PORTAGE, PRICE, RUSK, SHAWANO, TAYLOR, TEMPEALEAU, WAUPACA & WOOD COUNTIES

	Rates	Fringes
TRUCK DRIVER		
2 Axle Trucks	$ 35.57	26.09
3 or more Axles	$ 35.72	26.09

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* SUWI2002-001 01/23/2002

	Rates	Fringes
Fence Installers	$ 15.00 **	2.37
GLAZIER	$ 20.21	1.86
Painters:		
Brush & Roller (Excluding Drywall Finishing)	$ 14.64 **	2.55
Spray	$ 13.72 **	2.25
Power Equipment Operator		
Backhoe	$ 17.454	7.61
Excavator	$ 17.37	7.45
Front End Loader	$ 23.36	4.61
ROOFER	$ 15.52 **	3.21
TRUCK DRIVER (3-Axle)	$ 15.28 **	4.78

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.20) or 13658 ($12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information

on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate

that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

NOTICE TO BIDDERS
WAGE RATE DECISION

The wage rate decision of the Department of Labor which has been incorporated in these advertised specifications is incomplete in that the classifications may be omitted from the Department of Labor's decision.

Since the bidder is responsible, independently, for ascertaining area practice with respect to the necessity, or lack of necessity, for the use of these classifications in the prosecution of the work contemplated by this project, no inference may be drawn from the omission of these classifications concerning prevailing area practices relative to their use. Further, this omission will not, per se, be construed as establishing any governmental liability for increased labor cost if it is subsequently determined that such classifications are required.

There may be omissions and/or errors in the federal wage rates. The bidder is responsible for evaluating and determining the correct applicable rate.

If a project includes multiple types of construction (highway, bridge over navigable water, sanitary sewer and water main, building) and there is not a separate wage determination for this type of work included in the proposal, use the wage determination that is in the proposal.

If a project includes multiple types of construction, different wage rate determinations may be inserted into the contract (WI10/Highway = in all WisDOT highway contracts, WI15/Heavy = bridge over navigable water per USDOL and US Coast Guard designation, WI8/Heavy (Sewer & Water Line & Tunnel) = sanitary sewer and water main if the cost is more than 20% of the contract and/or at least $1,000,000, and Building). If multiple wage rate determinations are inserted into the contract, use the classification in the wage determination for the work being done. Use WI15 wage rates when working on the bridge and/or structure from bank to bank. Use WI8 wage rates when working on any sanitary sewer or water main work. Use Building wage rates for all work done within the footprint of the building. Use WI10 wage rates for all other highway work in the contract and approaches to structures. For example, if a laborer is working within the footprint of a building, use the Laborer rate in the Building wage determination inserted in the contract. If a laborer is working on a bridge/structure within the banks, use the Laborer rate in the WI15/Heavy wage determination if inserted in the contract. If the laborer is working on the highway, use the Laborer rate in the WI10/Highway wage determination.

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0002	201.0205 Grubbing	10.000 STA	_____.____	_____.____
0004	203.0100 Removing Small Pipe Culverts	1.000 EACH	_____.____	_____.____
0006	204.0100 Removing Concrete Pavement	726.000 SY	_____.____	_____.____
0008	204.0170 Removing Fence	76.000 LF	_____.____	_____.____
0010	204.0265 Abandoning Wells	1.000 EACH	_____.____	_____.____
0012	205.0100 Excavation Common	2,961.000 CY	_____.____	_____.____
0014	208.0100 Borrow	10,324.000 CY	_____.____	_____.____
0016	213.0100 Finishing Roadway (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0018	305.0110 Base Aggregate Dense 3/4-Inch	1,080.000 TON	_____.____	_____.____
0020	305.0120 Base Aggregate Dense 1 1/4-Inch	290.000 TON	_____.____	_____.____
0022	312.0110 Select Crushed Material	182.000 TON	_____.____	_____.____
0024	522.1015 Apron Endwalls for Culvert Pipe Reinforced Concrete 15-Inch	1.000 EACH	_____.____	_____.____
0026	531.2036 Drilling Shaft 36-Inch	10.000 LF	_____.____	_____.____
0028	531.4050 Foundation Camera Pole 50-FT	1.000 EACH	_____.____	_____.____
0030	601.0115 Concrete Curb Type G	160.000 LF	_____.____	_____.____
0032	602.0415 Concrete Sidewalk 6-Inch	31,000.000 SF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0034	602.0505 Curb Ramp Detectable Warning Field Yellow	52.000 SF	_____.____	_____.____
0036	602.0815 Concrete Driveway 7-Inch	770.000 SY	_____.____	_____.____
0038	606.0200 Riprap Medium	7.000 CY	_____.____	_____.____
0040	608.0315 Storm Sewer Pipe Reinforced Concrete Class III 15-Inch	162.000 LF	_____.____	_____.____
0042	611.0645 Inlet Covers Type MS-A	2.000 EACH	_____.____	_____.____
0044	611.3901 Inlets Median 1 Grate	2.000 EACH	_____.____	_____.____
0046	615.1000 Wisconsin Historical Marker	1.000 EACH	_____.____	_____.____
0048	616.0206 Fence Chain Link 6-FT	220.000 LF	_____.____	_____.____
0050	616.0329 Gates Chain Link (width) 01. 6-FT	2.000 EACH	_____.____	_____.____
0052	616.0329 Gates Chain Link (width) 02. 4-FT	2.000 EACH	_____.____	_____.____
0054	616.0700.S Fence Safety	1,000.000 LF	_____.____	_____.____
0056	618.0100 Maintenance and Repair of Haul Roads (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0058	619.1000 Mobilization	1.000 EACH	_____.____	_____.____
0060	623.0200 Dust Control Surface Treatment	5,300.000 SY	_____.____	_____.____
0062	624.0100 Water	24.000 MGAL	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0064	625.0100 Topsoil	500.000 SY	_____.____	_____.____
0066	625.0500 Salvaged Topsoil	10,200.000 SY	_____.____	_____.____
0068	627.0200 Mulching	8,100.000 SY	_____.____	_____.____
0070	628.1104 Erosion Bales	60.000 EACH	_____.____	_____.____
0072	628.1530.S Silt Fence Heavy Duty	3,000.000 LF	_____.____	_____.____
0074	628.1535.S Silt Fence Heavy Duty Maintenance	9,000.000 LF	_____.____	_____.____
0076	628.1905 Mobilizations Erosion Control	22.000 EACH	_____.____	_____.____
0078	628.1910 Mobilizations Emergency Erosion Control	16.000 EACH	_____.____	_____.____
0080	628.7005 Inlet Protection Type A	3.000 EACH	_____.____	_____.____
0082	628.7020 Inlet Protection Type D	3.000 EACH	_____.____	_____.____
0084	628.7560 Tracking Pads	2.000 EACH	_____.____	_____.____
0086	629.0210 Fertilizer Type B	7.000 CWT	_____.____	_____.____
0088	630.0140 Seeding Mixture No. 40	150.000 LB	_____.____	_____.____
0090	630.0200 Seeding Temporary	220.000 LB	_____.____	_____.____
0092	630.0500 Seed Water	190.000 MGAL	_____.____	_____.____
0094	631.0300 Sod Water	80.000 MGAL	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0096	631.1000 Sod Lawn	3,450.000 SY	_____.____	_____.____
0098	632.0101 Trees (species, root, size) 01. Overstory Tree, 2.5" Caliper, B&B	25.000 EACH	_____.____	_____.____
0100	632.0201 Shrubs (species, root, size) 01. Shrub, 12" Height, B&B	80.000 EACH	_____.____	_____.____
0102	632.0201 Shrubs (species, root, size) 03. Perennial, DP50, CG	678.000 EACH	_____.____	_____.____
0104	632.9101 Landscape Planting Surveillance and Care Cycles	24.000 EACH	_____.____	_____.____
0106	633.5200 Markers Culvert End	1.000 EACH	_____.____	_____.____
0108	634.0612 Posts Wood 4x6-Inch X 12-FT	4.000 EACH	_____.____	_____.____
0110	634.0614 Posts Wood 4x6-Inch X 14-FT	14.000 EACH	_____.____	_____.____
0112	637.2210 Signs Type II Reflective H	73.250 SF	_____.____	_____.____
0114	639.0108 Drill Hole in Earth 8-Inch	100.000 LF	_____.____	_____.____
0116	639.0112 Drill Hole in Earth 12-Inch	170.000 LF	_____.____	_____.____
0118	639.1008 Well Casing Pipe 8-Inch	182.000 LF	_____.____	_____.____
0120	639.1700 Well Screen	20.000 LF	_____.____	_____.____
0122	639.2100 Grout for Sealing Well Casing	54.000 CF	_____.____	_____.____
0124	639.4000 Test Pumping	2.000 EACH	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0126	642.5401 Field Office Type D	1.000 EACH	_____.____	_____.____
0128	643.0300 Traffic Control Drums	18,500.000 DAY	_____.____	_____.____
0130	643.0420 Traffic Control Barricades Type III	1,450.000 DAY	_____.____	_____.____
0132	643.0705 Traffic Control Warning Lights Type A	2,850.000 DAY	_____.____	_____.____
0134	643.0900 Traffic Control Signs	3,540.000 DAY	_____.____	_____.____
0136	643.0910 Traffic Control Covering Signs Type I	2.000 EACH	_____.____	_____.____
0138	643.0920 Traffic Control Covering Signs Type II	2.000 EACH	_____.____	_____.____
0140	643.1050 Traffic Control Signs PCMS	7.000 DAY	_____.____	_____.____
0142	643.3170 Temporary Marking Line Epoxy 6-Inch	610.000 LF	_____.____	_____.____
0144	643.5000 Traffic Control	1.000 EACH	_____.____	_____.____
0146	645.0120 Geotextile Type HR	13.000 SY	_____.____	_____.____
0148	650.4000 Construction Staking Storm Sewer	3.000 EACH	_____.____	_____.____
0150	650.4500 Construction Staking Subgrade	1,110.000 LF	_____.____	_____.____
0152	650.5000 Construction Staking Base	300.000 LF	_____.____	_____.____
0154	650.5500 Construction Staking Curb Gutter and Curb & Gutter	160.000 LF	_____.____	_____.____
0156	650.7000 Construction Staking Concrete Pavement	820.000 LF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0158	650.8501 Construction Staking Electrical Installations (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0160	650.9000 Construction Staking Curb Ramps	4.000 EACH	_____.____	_____.____
0162	650.9500 Construction Staking Sidewalk (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0164	650.9911 Construction Staking Supplemental Control (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0166	650.9920 Construction Staking Slope Stakes	1,110.000 LF	_____.____	_____.____
0168	652.0125 Conduit Rigid Metallic 2-Inch	30.000 LF	_____.____	_____.____
0170	652.0225 Conduit Rigid Nonmetallic Schedule 40 2-Inch	3,160.000 LF	_____.____	_____.____
0172	652.0235 Conduit Rigid Nonmetallic Schedule 40 3-Inch	215.000 LF	_____.____	_____.____
0174	653.0140 Pull Boxes Steel 24x42-Inch	6.000 EACH	_____.____	_____.____
0176	653.0164 Pull Boxes Non-Conductive 24x42-Inch	16.000 EACH	_____.____	_____.____
0178	654.0105 Concrete Bases Type 5	4.000 EACH	_____.____	_____.____
0180	654.0111 Concrete Bases Type 11	20.000 EACH	_____.____	_____.____
0182	654.0230 Concrete Control Cabinet Bases Type L30	1.000 EACH	_____.____	_____.____
0184	655.0610 Electrical Wire Lighting 12 AWG	1,440.000 LF	_____.____	_____.____
0186	655.0615 Electrical Wire Lighting 10 AWG	5,799.000 LF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0188	655.0625 Electrical Wire Lighting 6 AWG	450.000 LF	_____.____	_____.____
0190	656.0201 Electrical Service Meter Breaker Pedestal (location) 01. CB 100	1.000 EACH	_____.____	_____.____
0192	656.0501 Electrical Service Breaker Disconnect Box (location) 01. CCTV410190	1.000 EACH	_____.____	_____.____
0194	659.0700 Lighting Units Walkway	20.000 EACH	_____.____	_____.____
0196	659.2130 Lighting Control Cabinets 120/240 30-Inch	1.000 EACH	_____.____	_____.____
0198	670.0101 Field System Integrator	1.000 EACH	_____.____	_____.____
0200	670.0201 ITS Documentation	1.000 EACH	_____.____	_____.____
0202	671.0112 Conduit HDPE 1-Duct 2-Inch	585.000 LF	_____.____	_____.____
0204	671.0122 Conduit HDPE 2-Duct 2-Inch	480.000 LF	_____.____	_____.____
0206	673.1225.S Install Pole Mounted Cabinet	1.000 EACH	_____.____	_____.____
0208	677.0150 Install Camera Pole 50-FT	1.000 EACH	_____.____	_____.____
0210	677.0200 Install Camera Assembly	1.000 EACH	_____.____	_____.____
0212	678.0600 Install Ethernet Switches	1.000 EACH	_____.____	_____.____
0214	690.0250 Sawing Concrete	140.000 LF	_____.____	_____.____
0216	715.0720 Incentive Compressive Strength Concrete Pavement	500.000 DOL	1.00000	500.00

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0218	ASP.1T0A On-the-Job Training Apprentice at $5.00/ HR	2,500.000 HRS	5.00000	12,500.00
0220	ASP.1T0G On-the-Job Training Graduate at $5.00/ HR	3,520.000 HRS	5.00000	17,600.00
0222	SPV.0060 Special 01. Bench	13.000 EACH	_____.____	_____.____
0224	SPV.0060 Special 02. Litter Receptacle	33.000 EACH	_____.____	_____.____
0226	SPV.0060 Special 03. Recycling Receptacle	33.000 EACH	_____.____	_____.____
0228	SPV.0060 Special 04. Picnic Table	12.000 EACH	_____.____	_____.____
0230	SPV.0060 Special 05. ADA Picnic Table	4.000 EACH	_____.____	_____.____
0232	SPV.0060 Special 06. Flag Pole	3.000 EACH	_____.____	_____.____
0234	SPV.0060 Special 07. Planting Container	4.000 EACH	_____.____	_____.____
0236	SPV.0060 Special 08. Picnic Shelter	4.000 EACH	_____.____	_____.____
0238	SPV.0060 Special 09. Install Cellular Modem	1.000 EACH	_____.____	_____.____
0240	SPV.0060 Special 10. Ground Rod	1.000 EACH	_____.____	_____.____
0242	SPV.0060 Special 11. Rest Area Building General	1.000 EACH	_____.____	_____.____
0244	SPV.0060 Special 12. Rest Area Building Plumbing	1.000 EACH	_____.____	_____.____
0246	SPV.0060 Special 13. Rest Area Building HVAC	1.000 EACH	_____.____	_____.____
0248	SPV.0060 Special 14. Rest Area Building Electrical	1.000 EACH	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0250	SPV.0060 Special 15. Maintenance Building General	1.000 EACH	_____.____	_____.____
0252	SPV.0060 Special 16. Maintenance Building Plumbing	1.000 EACH	_____.____	_____.____
0254	SPV.0060 Special 17. Maintenance Building HVAC	1.000 EACH	_____.____	_____.____
0256	SPV.0060 Special 18. Maintenance Building Electrical	1.000 EACH	_____.____	_____.____
0258	SPV.0060 Special 19. Electrical Service, Sparta Rest Area	1.000 EACH	_____.____	_____.____
0260	SPV.0060 Special 20. Sewage Ejector Pump and Controls	1.000 EACH	_____.____	_____.____
0262	SPV.0060 Special 21. Pitless Adapter	2.000 EACH	_____.____	_____.____
0264	SPV.0060 Special 22. Well Pump	2.000 EACH	_____.____	_____.____
0266	SPV.0060 Special 23. Sanitary Sewer Manhole 4-ft	3.000 EACH	_____.____	_____.____
0268	SPV.0060 Special 24. Coring Manhole	1.000 EACH	_____.____	_____.____
0270	SPV.0060 Special 25. Well System Controls	1.000 EACH	_____.____	_____.____
0272	SPV.0060 Special 26. Adjusting Manhole Covers with Rubber Rings	1.000 EACH	_____.____	_____.____
0274	SPV.0060 Special 27. Bollard	7.000 EACH	_____.____	_____.____
0276	SPV.0090 Special 01. Split Rail Fence	260.000 LF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0278	SPV.0090 Special 02. Pipe Underdrain (8-Inch) with Geotextile Fabric and Aggregate	440.000 LF	_____.____	_____.____
0280	SPV.0090 Special 03. Forcemain PVC, 2-Inch	334.000 LF	_____.____	_____.____
0282	SPV.0090 Special 04. Sanitary Sewer PVC 4-Inch	42.000 LF	_____.____	_____.____
0284	SPV.0090 Special 05. Sanitary Sewer PVC 8-Inch	539.000 LF	_____.____	_____.____
0286	SPV.0090 Special 06. Underground Copper Water Line 1-Inch	390.000 LF	_____.____	_____.____
0288	SPV.0090 Special 07. Underground Copper Water Line 3-Inch	595.000 LF	_____.____	_____.____
0290	SPV.0090 Special 08. Construction Staking Sanitary Sewer System	915.000 LF	_____.____	_____.____
0292	SPV.0165 Special 01. Unit Paving	773.000 SF	_____.____	_____.____
	Section: 0001		**Total:**	_____.____
			Total Bid:	_____.____

PLEASE ATTACH ADDENDA HERE

Wisconsin Department of Transportation

Division of Transportation Systems Development
Bureau of Project Development
4822 Madison Yards Way, 4th Floor South
Madison, WI 53705

Telephone: (608) 266-1631
Facsimile (FAX): (608) 266-8459

May 7, 2024

NOTICE TO ALL CONTRACTORS:

Proposal #02: 1071-07-79, WISC2024351
La Crosse – Sparta
(Safety Rest Area 16 Sparta Building)
IH 90
Monroe County

Letting of May 14, 2024

This is Addendum No. 01, which provides for the following:

Special Provisions:

Revised Special Provisions	
Article No.	Description
28	Site Furnishings
39	General Requirements for Building Construction
42	Rest Area Building HVAC, Item SPV.0060.13; Maintenance Building HVAC, Item SPV.0060.17
43	Rest Area Building Electrical, Item SPV.0060.14; Maintenance Building Electrical, Item SPV.0060.18

Schedule of Items:

Added Bid Item Quantities					
Bid Item	Item Description	Unit	Proposal Total Prior to Addendum	Quantity Added	Proposal Total After Addendum
632.0101.01	Celtis Occidentalis 'Chicagoland' Chicagoland Hackberry, 2.5” Cal, B&B	EACH	0	9	9
632.0101.02	Gleditsia Triacanthos Inermis 'Skycole' Skyline Honey Locust, 2.5” Cal, B&B	EACH	0	6	6
632.0101.03	Quercus Alba White Oak, 2.5” Cal, B&B	EACH	0	6	6
632.0101.04	Quercus Bicolor Swamp White Oak, 2.5” Cal, B&B	EACH	0	4	4
632.0201.01	Aronia Melanocarpa Var. Elataglossy Black Chokeberry, 12” Height, Cont.	EACH	0	12	12
632.0201.02	Ceanothus Americanus New Jersey Tea, 12” Height, Cont. (Revise Name)	EACH	0	18	18

632.0201.03	Dasiphora Fruticosa Bush Cinquefoil, 12” Height, Cont.	EACH	0	3	3
632.0201.04	Diervilla Lonicera Dwarf Bush Honeysuckle, 12” Height, Cont.	EACH	0	9	9
632.0201.05	Ribes Americanum American Black Currant, 12” Height, Cont.	EACH	0	14	14
632.0201.06	Symphoricarpos Albus Common Snowberry, 12” Height, Cont.	EACH	0	24	24
632.0201.07	Anaphalis Margaritacea Pearly Everlasting, DP 50, Plug	EACH	0	28	28
632.0201.08	Asclepias Tuberosa Butterfly Milkweed, DP 50, Plug	EACH	0	74	74
632.0201.09	Asclepias Verticillata Whorled Milkweed, DP 50, Plug	EACH	0	72	72
632.0201.10	Bouteloua Curtipendula Side Oats Grama, DP 50, Plug	EACH	0	48	48
632.0201.11	Bouteloua Gracilis Blue Grama Grass, DP 50, Plug	EACH	0	31	31
632.0201.12	Dalea Purpurea Purple Prairie Clover, DP 50, Plug	EACH	0	48	48
632.0201.13	Echinacea Angustifolia Narrow Leaf Coneflower, DP 50, Plug	EACH	0	50	50
632.0201.14	Fragaria Vesca Woodland Strawberry, DP 50, Plug	EACH	0	86	86
632.0201.15	Heuchera Richardsonii Prairie Alum Root, DP 50, Plug	EACH	0	92	92
632.0201.16	Monarda Fistulosa Bergamot, DP 50, Plug	EACH	0	41	41
632.0201.17	Schizachyrium Scoparium Little Bluestem, DP 50, Plug	EACH	0	31	31
632.0201.18	Sporobolus Heterolepis Prairie Dropseed, DP 50, Plug	EACH	0	39	39
632.0201.19	Symphyotrichum Sericeum Silky Aster, DP 50, Plug	EACH	0	38	38

Deleted Bid Item Quantities					
Bid Item	Item Description	Unit	Proposal Total Prior to Addendum	Proposal Quantity Change (-)	Proposal Total After Addendum
632.0101.01	Overstory Tree, 2.5” Cal, B&B	EACH	25	-25	0
632.0201.01	Shrub, 12” Height, B&B	EACH	80	-80	0
632.0201.03	Perennial, DP50, CG	EACH	678	-678	0
656.0201.01	Electrical Service Meter Breaker Pedestal (CB 100)	EACH	1	-1	0

Plan Sheets:

Revised Plan Sheets	
Plan Sheet	Plan Sheet Title (brief description of changes to sheet)
43	Revised Building Architectural Plan (G1-11) – Detail sheet added to sheet index
47	Revised Building Architectural Plan (G1-21) – Added door actuator button to code data plan and floor plan

71	Revised Building Architectural Plan (A1-31B) – Clean up tags
82-84	Revised Building Architectural Plan (A2-11 – A2-13) – Revised exterior finish schedule, revised exterior elevation tags, revised exterior elevation names
87-91	Revised Building Architectural Plan (A3-21 – A3-31) – Revised approx. grade, revised detail components, revised visible levels, added insulation, revised wall & base details
94	Revised Building Architectural Plan (A3-34) – Revised detail annotation
99	Revised Building Architectural Plan (A4-11) – Revised door schedule
102-103	Revised Building Architectural Plan (A4-21 – A4-22) – Revised detail annotation at window sills
107-109	Revised Building Architectural Plan (A5-11 – A5-13) – Revised spelling
195	Revised Building Architectural Plan (E2-00) – Update keynote #46. Add (2) well pump and (1) sewage ejector pump locations on plan.
201	Revised Building Architectural Plan (E4-11) – Update electrical riser to have contractor refer to SPV 0060.19 for electrical service requirements.
205	Revised Building Architectural Plan (E5-11) – Add (2) 40A 3-pole breakers to MDP for well pumps (by others)
208-209	Revised Building Architectural Plan (E5-14 – E5-15) – Add (1) 20A 2-pole breaker to P2 for sewage ejector pump (by others) and add well pumps (WP-1 and WP-2) and sewage ejector pump (SEP-1) to schedule.
300	Miscellaneous Quantities – Remove planting table and moved to sheet 300A
305	Miscellaneous Quantities – Removed item 656.0201.01 from Lighting Control table

Added Plan Sheets	
Plan Sheet	Plan Sheet Title (brief description of why sheet was added)
97A	Building Architectural Plan (A3-38) (additional details)
300A	Miscellaneous Quantities – Revised planting table

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractor.

Sincerely,

Mike Coleman

Proposal Development Specialist
Proposal Management Section

ADDENDUM NO. 01

1071-07-79

May 7, 2024

Special Provisions

28. Site Furnishings.

Replace section 2.1 (c) under subsection titiled **Part 2 Products** *under section titled* **Section 32 33 00 – Site Furnishings** *with the following:*

C. Cedar Forest Products; https://cedarforestproducts.com/

1. Sales Contact: Ryan Candler, ABCreative, Phone: (515) 333-9800, Email: Ryan@ABCreative.net

Replace section 2.2 (B) (C) and (D) under subsection titiled **Part 2 Products** *under section titled* **Section 32 33 00 – Site Furnishings** *with the following:*

B. Picnic Table.

1. Manufacturer: Kay Park.
2. Model: Single Post Picnic Table, Model No. 4SPTCVPN or Approved Equal.
   a. 46” Square Top.

C. ADA Picnic Table.

1. Manufacturer: Kay Park.
2. Model: Single Post Picnic Table, Model No. 4SPTCVPN-3S or Approved Equal.
   a. 46″ Square Top.

D. Bench.

1. Manufacturer: Kay Park.
2. Model: 6’ Stationary Bench with Back, Model No. 62SCVPN or Approved Equal.

39. General Requirements for Building Construction.

Replace section 1.1 (A) under subsection titiled **Part 1 General** *under section titled* **Section 00 31 00 – Available Project Information** *with the following:*

A. A copy of the geotechnical evaluation report with respect to the building site is available at the following location:
https://wisdot.box.com/s/dq18rd54chqojxffi1a635pps4cd70rg or can be accessed on the HCCI May bid letting page under Supplemental Information.

42. Rest Area Building HVAC, Item SPV.0060.13; Maintenance Building HVAC, Item SPV.0060.17.

Replace section 2.5 (A) (C) and (D) under subsection titiled **Part 2 Products** *under section titled* **Section 23 21 23 – Hydronic Pumps** *with the following:*

A. Type: Horizontal shaft, single stage, radially or horizontally split casing, for 125 psi maximum working pressure.

Delete section titled **2.6 Base-Mounted Pumps** *subsection titiled* **Part 2 Products** *under section titled* **Section 23 21 23 – Hydronic Pumps.**

Add the following to section titled **2.1 Manufacturers** *under subsection titiled* **Part 2 Products** *under section titled* **Section 23 81 28 – Water to Air Heat Pumps***:*

U. Climatemaster: www.climatemaster.com.

Add the following to section titled **2.1 Manufacturers** *under subsection titiled* **Part 2 Products** *under section titled* **Section 23 81 28 – Ground-Source Unitary Heat Pumps***:*

5. Climatemaster: www.climatemaster.com.

42. Rest Area Building Electrical, Item SPV.0060.14; Maintenance Building Electrical, Item SPV.0060.18

Replace section 1.3 (E) under subsection titiled **Part 1 General** *under section titled* **Section 26 00 10 – Basic Electrical Requirements** *with the following:*

E. The Electrical Contractor is responsible for contacting the utility company and coordinating the power connection for the building service. The costs of the utility connection will be paid separately by the Department.

Add Section **28 00 00 – Video Surveillance***:*

Section 28 20 00 - Video Surveillance

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Video surveillance system requirements.
B. Video recording and viewing equipment.
C. Cameras.
D. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.
B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
D. Section 26 05 33.13 - Conduit for Electrical Systems.
E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
F. Section 27 10 00 - Structured Cabling: Data cables for IP video surveillance system network connections.
G. Section 28 10 00 - Access Control: For interface with video surveillance system.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.

B. IEEE 802.3 - IEEE Standard for Ethernet; 2022, with Amendments (2023).

C. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 303 - Standard for Installing and Maintaining Closed-Circuit Television (CCTV) Systems; 2019.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

2. Coordinate the work with other installers to provide power for equipment at required locations.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.

2. Conduct meeting with facility representative and other related equipment manufacturers to discuss video surveillance system interface requirements.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Design Data:

1. Standby battery/UPS calculations.

2. Video storage capacity calculations.

E. Certify that proposed system design and components meet or exceed specified requirements.

F. Evidence of qualifications for installer.

G. Evidence of qualifications for maintenance contractor (if different entity from installer).

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

I. Manufacturer’s detailed field testing procedures.

J. Field quality control test reports.

K. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

L. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

M. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

N. Maintenance contracts.

O. Software: One copy of software not resident in read-only memory.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.

2. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1. Contract maintenance office located within 100 miles of project site.

E. Maintenance Contractor Qualifications: Same entity as installer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer's recommended limits.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum five year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Video Recording and Viewing Equipment:

1. Axis Communications: www,axis.com

2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cameras:

1. Axis Communications: www.axis.com

2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Source Limitations: Where possible, furnish system components and accessories produced by single manufacturer and obtained from single supplier.

2.2 VIDEO SURVEILLANCE SYSTEM

A. Provide new video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.
   1. Video Storage Capacity: Suitable for storing video from all cameras for 30 days.
   2. System Battery Backup: Provide batteries/uninterruptible power supplies (UPS) as required for 20 minutes full operation.

C. Cameras Required: Axis
   1. See article "CAMERAS" below for product descriptions.
   2. Camera 1
   3. Camera 2
      a. Camera Type: Interior Fixed Dome
      b. Camera Type: Exterior Fixed Dome
      c. Lens Type: Furnished with camera.
      d. Interior Mounting: Surface, CeilingTile, Or Gypsum Mounted
      e. Mounting: Corner Mounted Bracket
      f. Mounting: Wall Mount
      g. Mounting: Pendant Kit

D. Video Recording and Viewing Equipment Required:
   1. See article "VIDEO RECORDING AND VIEWING EQUIPMENT" below for product descriptions.
   2. Equiptment located in ELECT/IT 115
      a. NVR server.
      b. NVR storage unit(s).
      c. Equipment rack.
      d. Uninterruptible power supply (UPS).

E. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with video surveillance system.
   2. Interface with future access control system

F. Provide products listed, classified, and labeled as suitable for the purpose intended.

G. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.3 VIDEO RECORDING AND VIEWING EQUIPMENT

A. Provide video recording and viewing equipment compatible with cameras to be connected.

B. Network Video Recorders (NVRs):
   1. Supports connection of network (IP) cameras.
   2. Supports continuous and event-based recording.
   3. Network Video Recorder Type AXIS S3016:
      a. Capacity: 16 channels.
      b. Recording and Viewing Performance: 30 fps at 1080 resolution.
      c. Storage Capacity: 30 TB.
      d. Removable Media: DVD-RW, USB.
      e. Network: Single 1 Gigabit Ethernet.
      f. Features:
         (1) Supports remote access via axis camera station
         (2) Desktop
         (3) Mobile

C. Computers:

1. Workstation Computers: Unless otherwise indicated, workstation computer to be furnished by owner. Video surveillance system to be provided by Contractor as part of work of this section, meeting video surveillance system equipment manufacturer's minimum requirements.
2. Servers: Unless otherwise indicated, server hardware not furnished by video surveillance system manufacturer to be provided by Contractor as part of work of this section, video surveillance system equipment meeting manufacturer's minimum requirements.

D. Software:

1. Unless otherwise indicated, provide all software and licenses required for fully operational system.
2. Video Management System:
   a. Axis Camera Station

2.4 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, Seal Tight, Fittings, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:

1. Signal-to-Noise Ratio: Not less than 50 dB.
2. Provide the following standard features:
   a. Automatic electronic shutter.
   b. Automatic gain control.
   c. Automatic white balance.
   d. Web-based interface for remote viewing and setup.
   e. Password protected security access.
3. Network (IP) Fixed Dome Panoramic Camera - P-3727-PLE 4X2 MP MULTIDIRECTIONAL CAMERA WITH IR FOR 360 COVERAGE; www.axis.com/#sle.
   a. Maximum Video Resolution: 1920X1080.
   b. Maximum Frame Rate: 25/30 FPS AT 50/60HZ
   c. Image Sensor Size: 4X1/2.8
   d. Minimum Illumination/Light Sensitivity (Color): 17 lux.
   e. Lens: F1.8-2.6 VARIFOCAL
   f. Features: Zipstream, forensic capture wide dynamic range, local storage, Power over Ethernet (PoE), day and night functionality, built-in IR illumination.
4. Network (IP) Fixed Dome 180 Degree - Basis of Design: Axis Communications M3066-V www.axis.com/#sle.
   a. Maximum Video Resolution: 2304 x 1728.
   b. Maximum Frame Rate: 25/30 fps at 50/60 Hz.
   c. Image Sensor Size: 1 x 1.25 inch.
   d. Minimum Illumination/Light Sensitivity (Color): 0.23 lux.
   e. Lens: 2.4 MM F2.1 Horizontal Field Of View 131Degrees.
   f. Features: Forensic capture wide dynamic range, Zipstream, Power over Ethernet (PoE), day and night functionalit

2.5 ACCESSORIES

A. Camera Enclosures: Where not factory-installed, provide camera enclosures suitable for operation under service conditions at installed location.

B. Camera Mounting Supports: Where not factory installed, provide mounting supports necessary for installation.

1. Products:AXIS T91A64 CORNER BRACKET

2. AXIS T91D61 WALL MOUNT

3. AXIS T94N01D PENDENT KIT

a. Substitutions: See Section 01 60 00 - Product Requirements.

C. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

D. Provide components as indicated or as required for system power and network connections.

E. Provide cables as indicated or as required for connections between system components.

1. Data Cables for IP Network Connections: Unshielded twisted pair (UTP), minimum Category 5e, complying with Section 27 10 00.

F. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 05 29.

D. Wiring Method: Unless otherwise indicated, use cables (not in conduit).

1. Use suitable listed cables in wet locations, including underground raceways.

2. Use suitable listed cables for vertical riser applications.

3. Use listed plenum rated cables in spaces used for environmental air.

4. Install wiring in conduit for the following:

a. Where required for rough-in.

b. Where required by authorities having jurisdiction.

c. Where exposed to damage.

d. Where installed outside the building.

e. For exposed connections from outlet boxes to cameras.

5. Conduit: Comply with Section 26 05 33.13.

6. Conceal all cables unless specifically indicated to be exposed.

7. Cables in the following areas may be exposed, unless otherwise indicated:

a. Equipment closets.

b. Within joists in areas with no ceiling.

8. Route exposed cables parallel or perpendicular to building structural members and

surfaces.

9. Include service loop cable lengths to allow relocation of cameras within 30 ft of installed location.

E. Provide grounding and bonding in accordance with Section 26 05 26.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

G. Identify system wiring and components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

E. Program system parameters according to requirements of Owner.

F. Test for proper interface with other systems.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

H. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 COMPONENT RIGGING

A. At all time shall the contractor engage in safe rigging practices to mount, fasten, and attach spacific electronic components and associated hardware.

B. All hardware should be hardend steel forged designed for and implemented utilizing manufactures recomended spacific work load limits. Fasteners shall be grad 5 or better in all cases except where detailed.

3.5 CLEANING

A. Contractor is responsible for keeping the job site clean and remove all trash at the end of each day. The contractor must cooperate with building officals to keep disruption to the jobsite to a minimum, and shall be responsible for all damages caused by installation.

3.6 LABELING

A. All cables, patch panels, biscuits shall be permanently labeled in a neat fashion specific to location. Acceptable methods include:

1. Brother P-touch {Laminate Type}
2. Dymo Laminate Type
3. Lamacoid Engraved Labels

3.7 OWNER INSTRUCTION

A. Schedule at least 14 days in advance of owner's intended first use of the system, a training session with the owner and opperating personnel. Opperating training should include the following.

1. Overview of operation including power up and power down procedures.
2. Demonstration on software {Recording and playback}
3. Question and anwser session.

B. Training shall be documented and completion shall be reported to the architect.

C. The owner may request as many as two additional training sessions at no additional expense to the owner.

3.8 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Verification that all cameras have the most recent firmwareversion installed.

E. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

F. Owner shall have total turn-key system complete and functional, consistant with the manufacturer's specifications.

3.9 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.10 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of video surveillance system for five years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

C. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

Schedule of Items
Attached, dated May 7, 2024, are the revised Schedule of Items Pages 1 – 12.

Plan Sheets
The following 8½ x 11-inch sheets are attached and made part of the plans for this proposal:
Revised: 43, 47, 71, 82-84, 87-91, 94, 99, 102-103, 107-109, 195, 201, 205, 208-209, 300 and 305.
Added: 97A and 300A.

END OF ADDENDUM

SPARTA REST AREA NO. 16

MAINTENANCE BUILDING

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Revised Sheet 43
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WISCONSIN PAUL C. NELSON DES MOINES IA LANDSCAPE ARCHITECT

WISCONSIN ALISHA R. CAMPBELL A-11297 DE PERE, WI ARCHITECT

WISCONSIN GREGORY A. MARTIN E-19289-6 CHIPPEWA FALLS, WISC PROFESSIONAL ENGINEER

WISCONSIN SEAN K. DIEDRICH E-41615 APPLETON, WISC PROFESSIONAL ENGINEER

WISCONSIN ALEX GIBSON E-19214-6 HUTCHINSON, MINN PROFESSIONAL ENGINEER

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	SHEET INDEX	SHEET NO: G1-11 43

PLOT DATE: 4/29/2024 9:15:52 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

CODE DATA PLAN KEY

EXIT

FIRE EXTINGUISHER

FIRE EXTINGUISHER CABINET

AB — DOOR ACTUATOR BUTTON

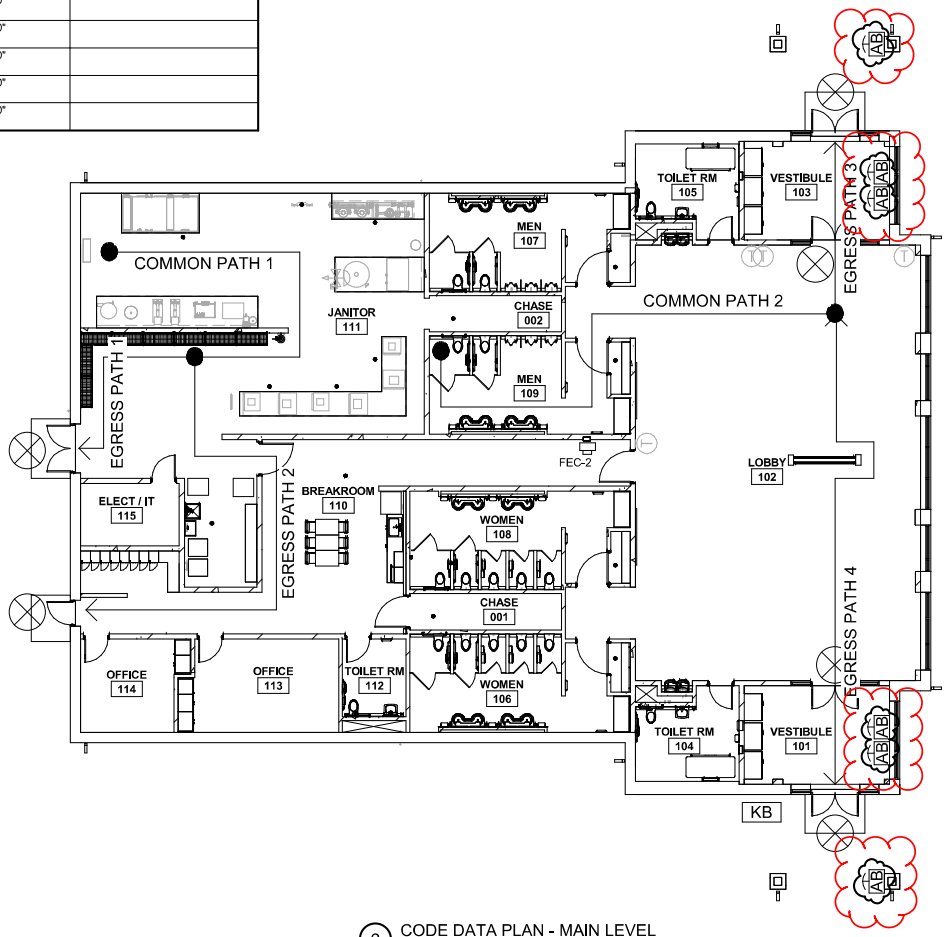
KB — KNOX BOX

FIRE WALLS, FIRE BARRIERS, FIRE PARTITIONS, SMOKE BARRIERS AND SMOKE PARTITIONS OR ANY OTHER WALL REQUIRED TO HAVE PROTECTED OPENINGS OR PENETRATIONS SHALL BE EFFECTIVELY AND PERMANENTLY IDENTIFIED WITH SIGNS OR STENCILING. SUCH IDENTIFICATION SHALL:

1. BE LOCATED IN ACCESSIBLE CONCEALED FLOOR, FLOOR-CEILING OR ATTIC SPACES
2. BE LOCATED WITHIN 15 FEET OF THE END OF EACH WALL AND AT INTERVALS NOT EXCEEDING 30 FEET MEASURED HORIZONTALLY ALONG THE WALL OR PARTITION, AND
3. INCLUDE LETTERING NOT LESS THAN 3 INCHES IN HEIGHT WITH A MINIMUM 3/8" STROKE IN A CONTRASTING COLOR INCORPORATING THE SUGGESTED WORDING "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS" OR OTHER SIMILAR WORDING.

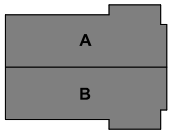
EGRESS PATH SCHEDULE

MARK	TRAVEL DISTANCE	CLEAR WIDTH	COMMENTS
COMMON PATH 1	51' - 6"	3' - 0"	
COMMON PATH 2	69' - 10"	3' - 0"	
EGRESS PATH 1	26' - 8"	3' - 0"	
EGRESS PATH 2	67' - 6"	3' - 0"	
EGRESS PATH 3	22' - 0"	3' - 0"	
EGRESS PATH 4	70' - 2"	3' - 0"	



2 CODE DATA PLAN - MAIN LEVEL
1/16" = 1'-0"

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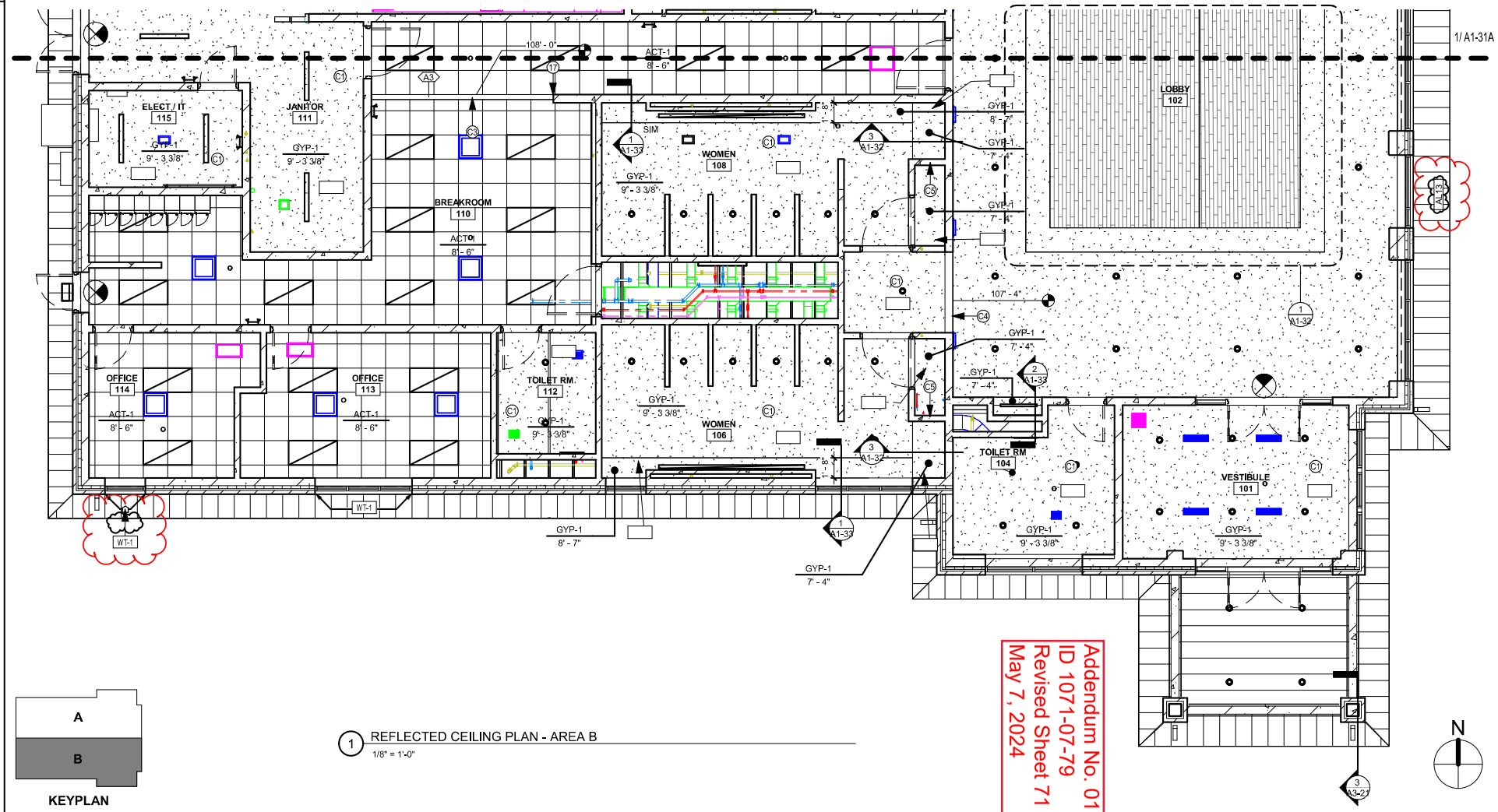
KEYPLAN

N

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	CODE DATA AND CODE DATA PLAN	SHEET NO: G1-21 47

PLOT DATE: 4/29/2024 9:15:55 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

REFER TO SHEET A1-31 - REFLECTED CEILING PLAN FOR SHEET NOTES AND KEYNOTE LEGEND.



A
B

KEYPLAN

1 REFLECTED CEILING PLAN - AREA B

1/8" = 1'-0"

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Revised Sheet 71
May 7, 2024

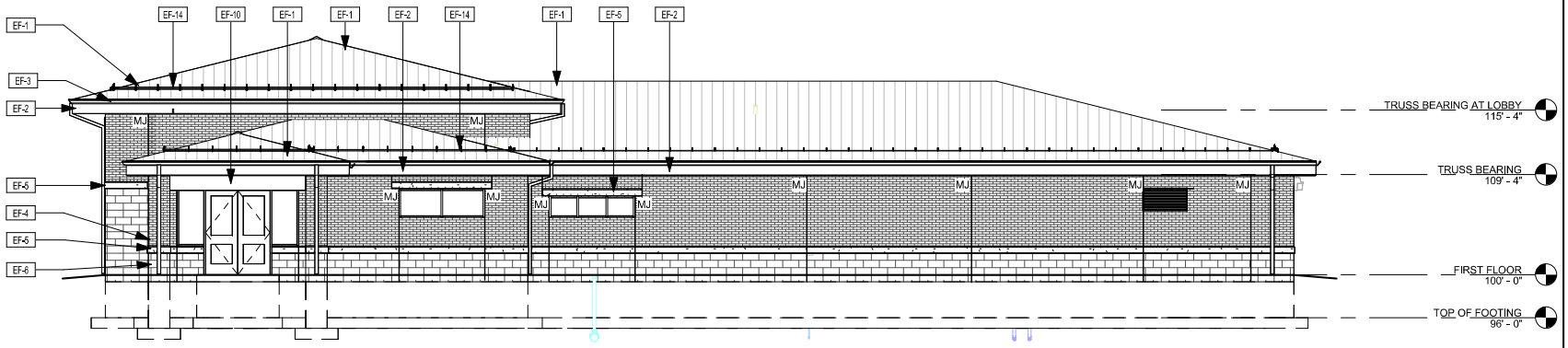
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STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	REFLECTED CEILING PLAN - AREA B	SHEET NO: A1-31B 71

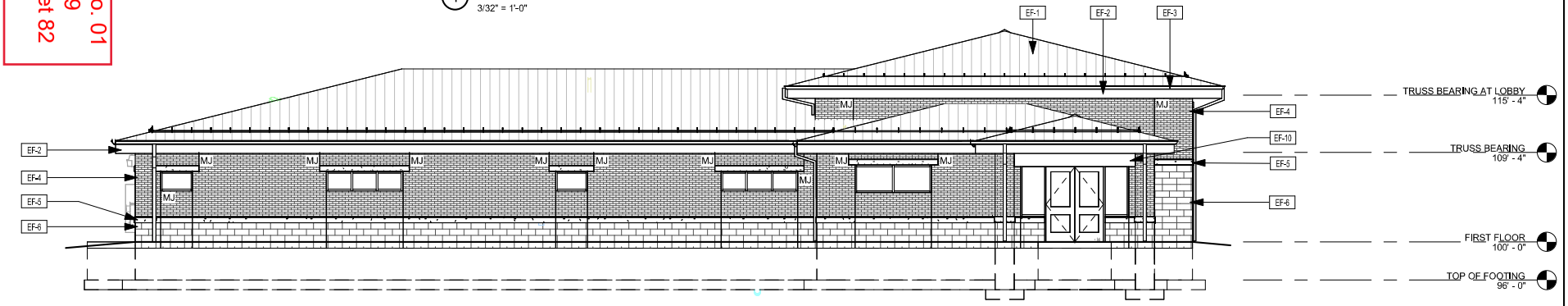
PLOT DATE: 4/29/2024 1:58:22 PM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

EXTERIOR FINISH SCHEDULE

MARK	MATERIAL TYPE	MANUFACTURER	MODEL / SIZE	COLOR	ADDITIONAL INFORMATION	COMMENTS
EF-1	STANDING SEAM ROOFING	UNACLAD	PENCIL RIBBED / UC 6	EXTRA DARK BRONZE		
EF-2	PRE-FIN MTL FASCIA TRIM	UNACLAD		EXTRA DARK BRONZE		
EF-3	PRE-FIN MTL GUTTER			DARK BRONZE		
EF-4	BRICK	GLEN GARY	MODULAR	MOUNTAIN SHADOW VELOUR		
EF-5	CAST STONE BAND	CUSTOM CAST STONE	SEE DETAIL	CREME	CREME	
EF-6	CAST STONE	CUSTOM CAST STONE	8" X 16"	CREME		
EF-8	ALUM STOREFRONT WINDOW FRAMING SYSTEM	KAWNEER		DARK BRONZE		
EF-10	COMPOSITE METAL PANEL	ALUCABOND		DARK BRONZE		
EF-14	SNOW GUARD	SNO-JAX	-	MATCH METAL ROOF COLOR	SNOW BAR TO MATCH ROOF COLOR	REFER TO ROOF PLAN
EF-15	RIDGE CAP			MATCH METAL ROOF COLOR		



1 NORTH ELEVATION
3/32" = 1'-0"



2 SOUTH ELEVATION
3/32" = 1'-0"

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Revised Sheet 82
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	EXTERIOR ELEVATIONS	SHEET NO: A2-11 82

PLOT DATE: 4/29/2024 9:15:21 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

KEYNOTE LEGEND	
18	WATERTABLE BAND TO RECESS AT CT CABINET TO PROVIDE FLUSH SURFACE FOR MOUNTING, REFER TO ELECTRICAL DOCUMENTS.

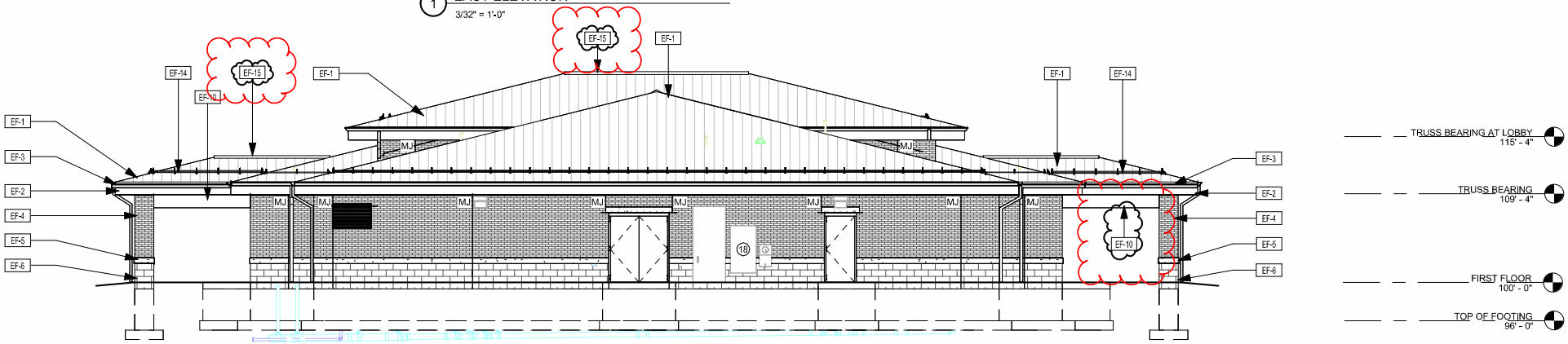
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ID 1071-07-79
Revised Sheet 83
May 7, 2024

EXTERIOR FINISH SCHEDULE

MARK	MATERIAL TYPE	MANUFACTURER	MODEL / SIZE	COLOR	ADDITIONAL INFORMATION	COMMENTS
EF-1	STANDING SEAM ROOFING	UNACLAD	PENCIL RIBBED / UC 6	EXTRA DARK BRONZE		
EF-2	PRE-FIN MTL FASCIA TRIM	UNACLAD		EXTRA DARK BRONZE		
EF-3	PRE-FIN MTL GUTTER			DARK BRONZE		
EF-4	BRICK	GLEN GARY	MODULAR	MOUNTAIN SHADOW VELOUR		
EF-5	CAST STONE BAND	CUSTOM CAST STONE	SEE DETAIL	CREME	CREME	
EF-6	CAST STONE	CUSTOM CAST STONE	8" X 16"	CREME		
EF-8	ALUM STOREFRONT WINDOW FRAMING SYSTEM	KAWNEER		DARK BRONZE		
EF-10	COMPOSITE METAL PANEL	ALUCABOND		DARK BRONZE		
EF-14	SNOW GUARD	SNO-JAX	-	MATCH METAL ROOF COLOR	SNOW BAR TO MATCH ROOF COLOR	REFER TO ROOF PLAN
EF-15	RIDGE CAP			MATCH METAL ROOF COLOR		



1 EAST ELEVATION
3/32" = 1'-0"



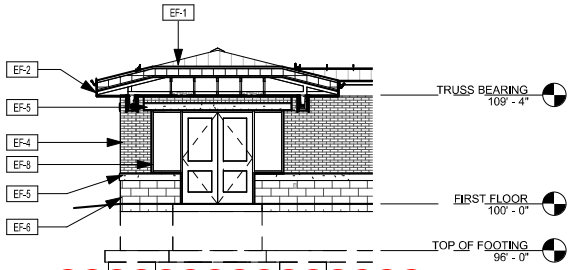
2 WEST ELEVATION
3/32" = 1'-0"

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	EXTERIOR ELEVATIONS	SHEET NO: A2-12	83

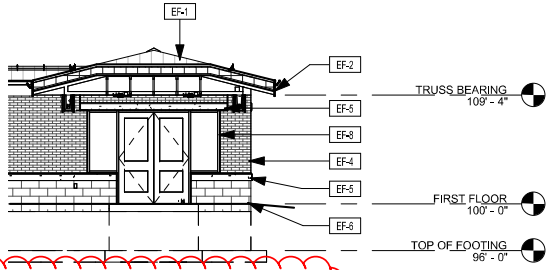
PLOT DATE: 4/29/2024 1:58:26 PM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

EXTERIOR FINISH SCHEDULE

MARK	MATERIAL TYPE	MANUFACTURER	MODEL / SIZE	COLOR	ADDITIONAL INFORMATION	COMMENTS
EF-1	STANDING SEAM ROOFING	UNACLAD	PENCIL RIBBED / UC 6	EXTRA DARK BRONZE		
EF-2	PRE-FIN MTL FASCIA TRIM	UNACLAD		EXTRA DARK BRONZE		
EF-3	PRE-FIN MTL GUTTER			DARK BRONZE		
EF-4	BRICK	GLEN GARY	MODULAR	MOUNTAIN SHADOW VELOUR		
EF-5	CAST STONE BAND	CUSTOM CAST STONE	SEE DETAIL	CREME	CREME	
EF-6	CAST STONE	CUSTOM CAST STONE	8" X 16"	CREME		
EF-8	ALUM STOREFRONT WINDOW FRAMING SYSTEM	KAWNEER		DARK BRONZE		
EF-10	COMPOSITE METAL PANEL	ALUCABOND		DARK BRONZE		
EF-14	SNOW GUARD	SNO-JAX	-	MATCH METAL ROOF COLOR	SNOW BAR TO MATCH ROOF COLOR	REFER TO ROOF PLAN
EF-15	RIDGE CAP			MATCH METAL ROOF COLOR		

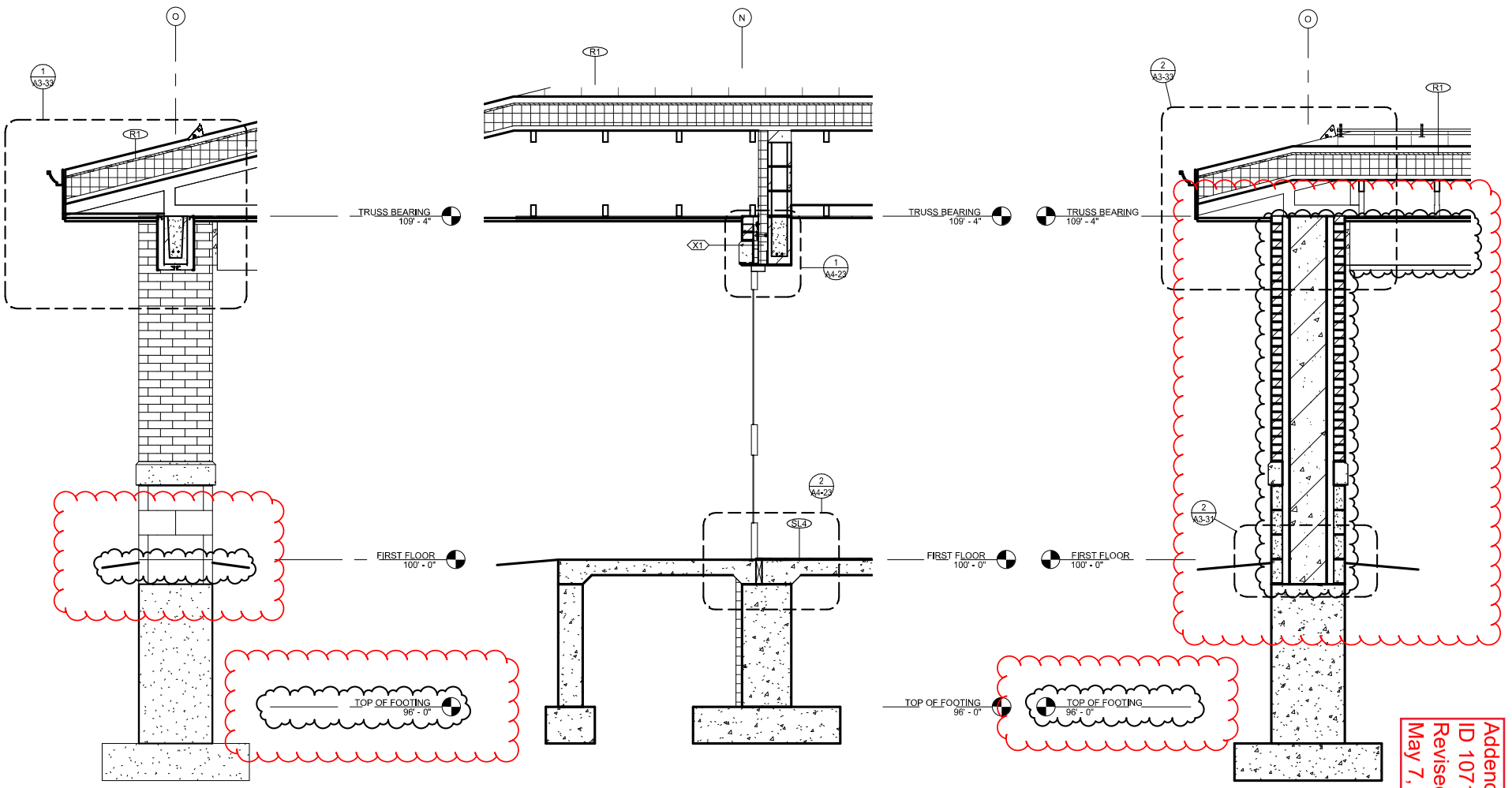


1 NORTH ENTRY ELEVATION
3/32" = 1'-0"



2 SOUTH ENTRY ELEVATION
3/32" = 1'-0"

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May 7, 2024



1 WALL SECTION
3/8" = 1'-0"

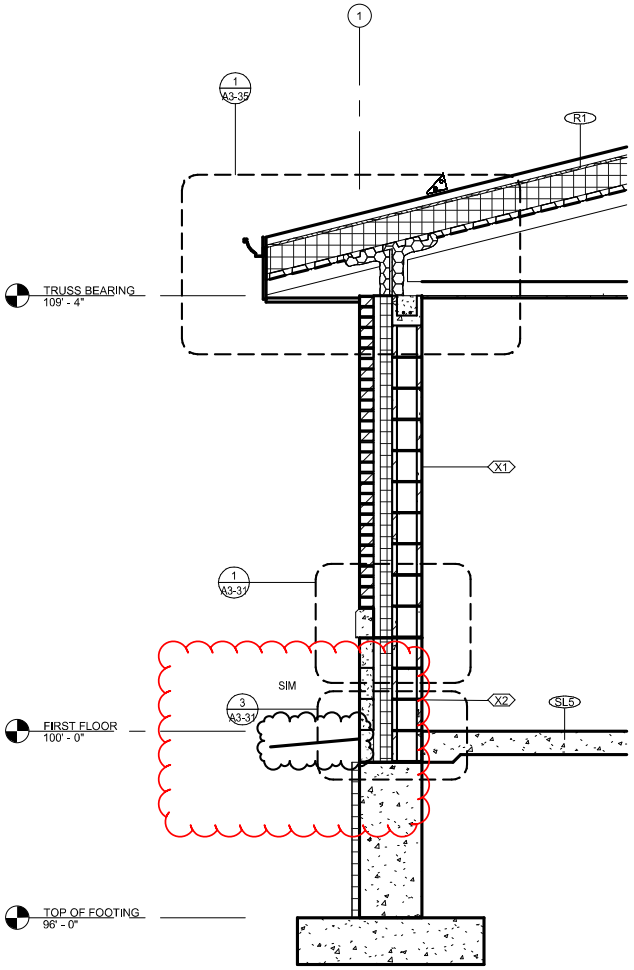
2 WALL SECTION
3/8" = 1'-0"

3 WALL SECTION
3/8" = 1'-0"

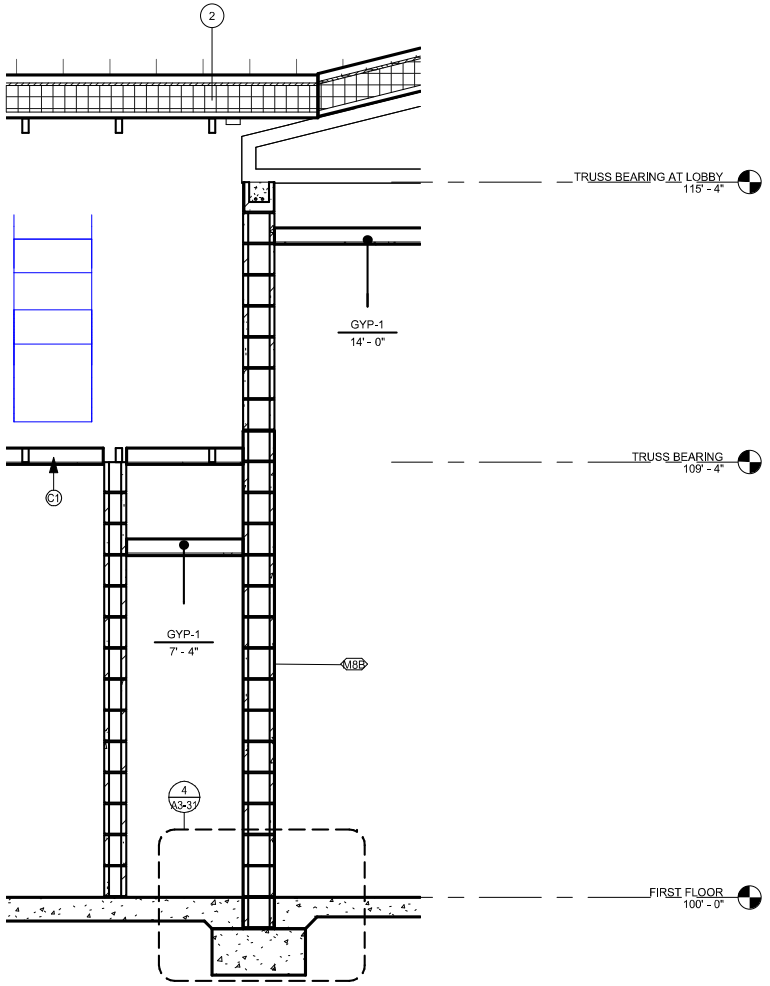
Addendum No. 01
ID 1071-07-79
Revised Sheet 87
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WALL SECTIONS	SHEET NO: A3-21 87

PLOT DATE: 4/29/2024 9:15:33 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



1 WALL SECTION
3/8" = 1'-0"



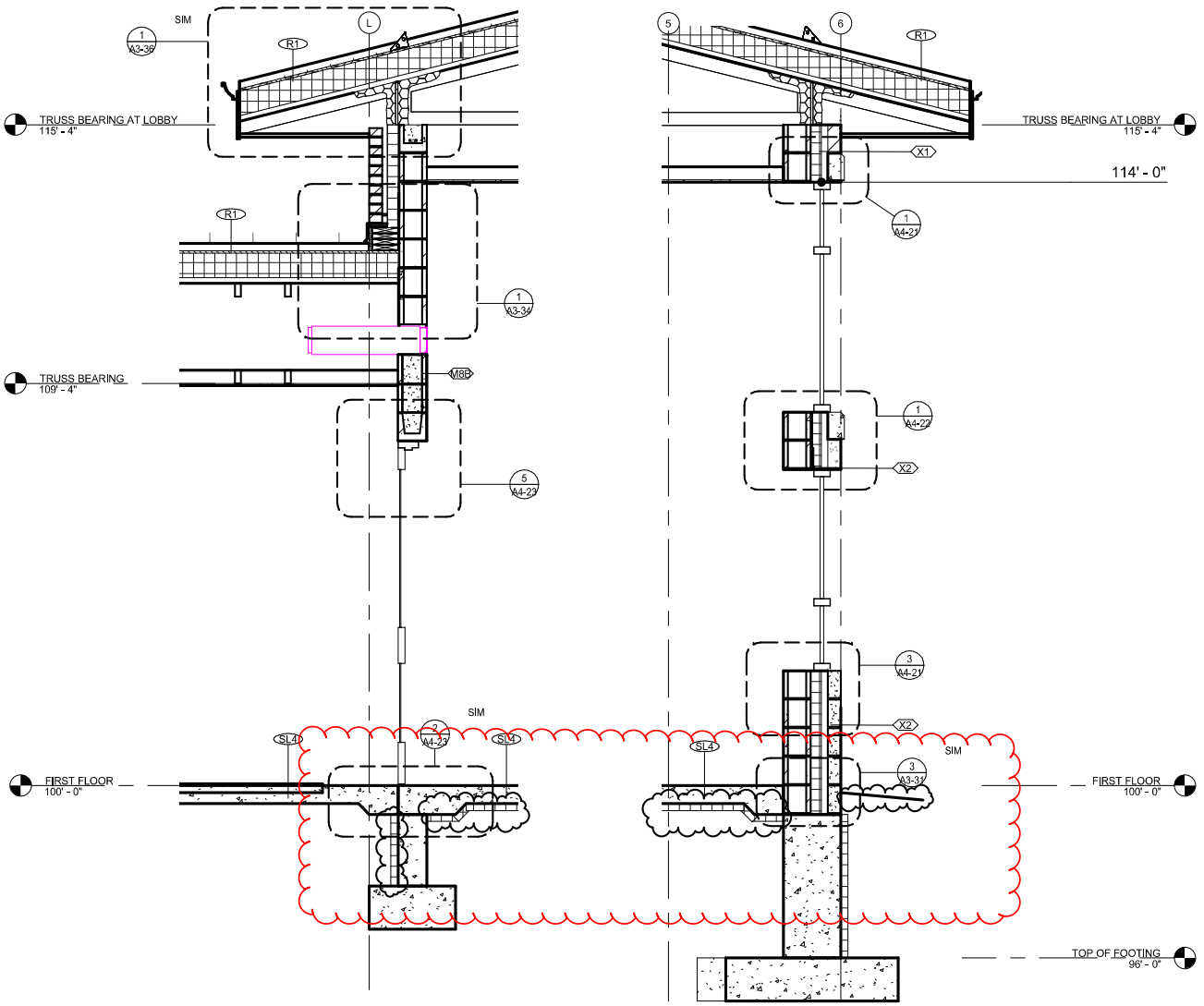
2 WALL SECTION
3/8" = 1'-0"

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ID 1071-07-79
Revised Sheet 88
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WALL SECTIONS	SHEET NO: A3-22	88

PLOT DATE: 4/29/2024 9:15:34 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

Addendum No. 01
ID 1071-07-79
Revised Sheet 89
May 7, 2024



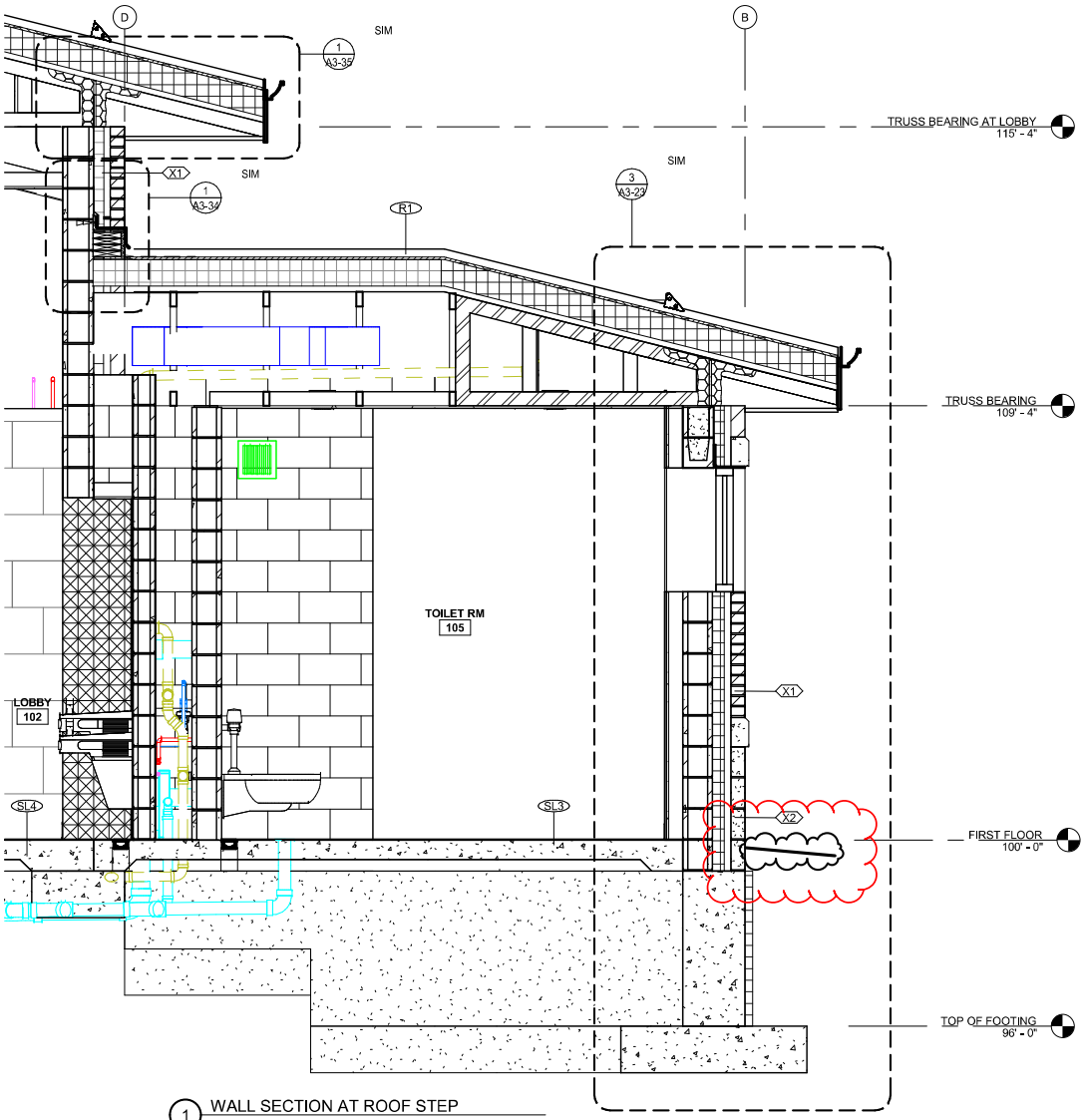
1 WALL SECTION
3/8" = 1'-0"

2 WALL SECTION
3/8" = 1'-0"

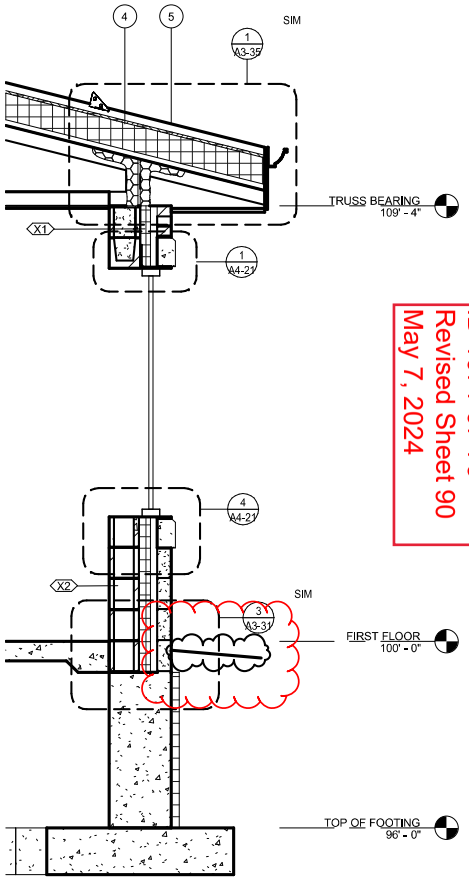
3 WALL SECTION
3/8" = 1'-0"

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WALL SECTIONS	SHEET NO: A3-23 89

PLOT DATE: 4/29/2024 1:58:26 PM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



1 WALL SECTION AT ROOF STEP
3/8" = 1'-0"

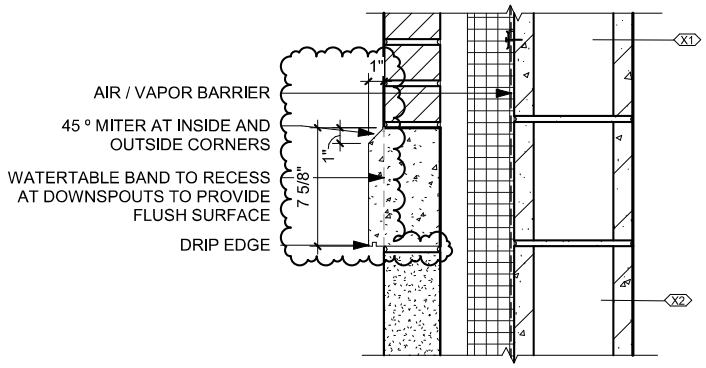


2 WALL SECTION
3/8" = 1'-0"

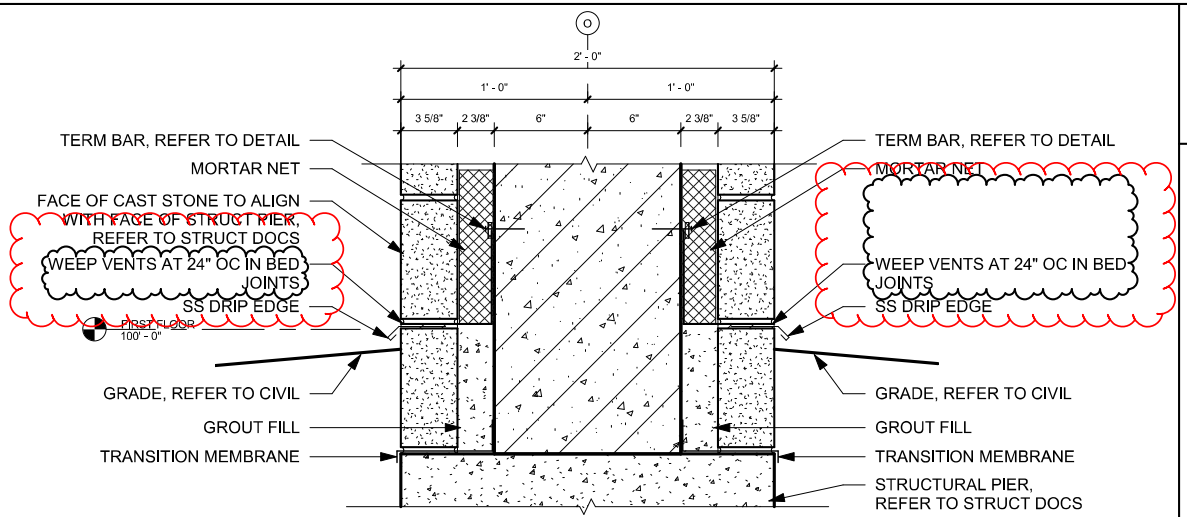
Addendum No. 01
ID 1071-07-79
Revised Sheet 90
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WALL SECTIONS	SHEET NO: A3-24 90

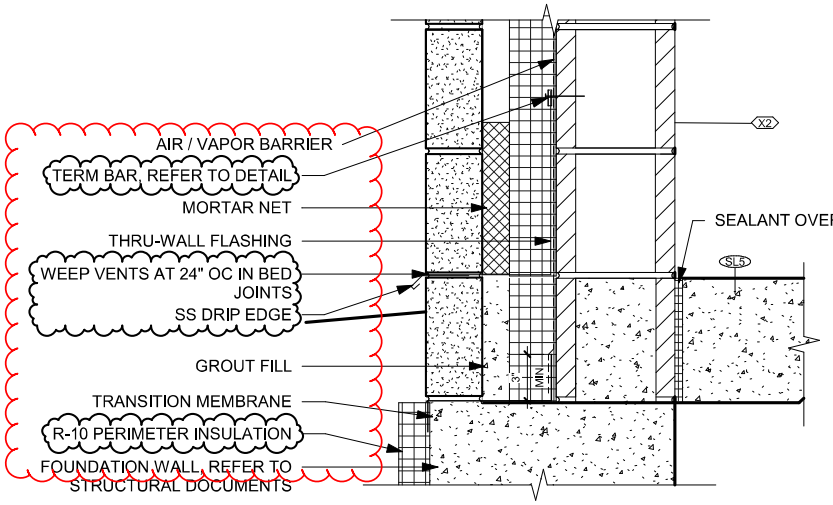
PLOT DATE: 4/29/2024 9:15:37 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



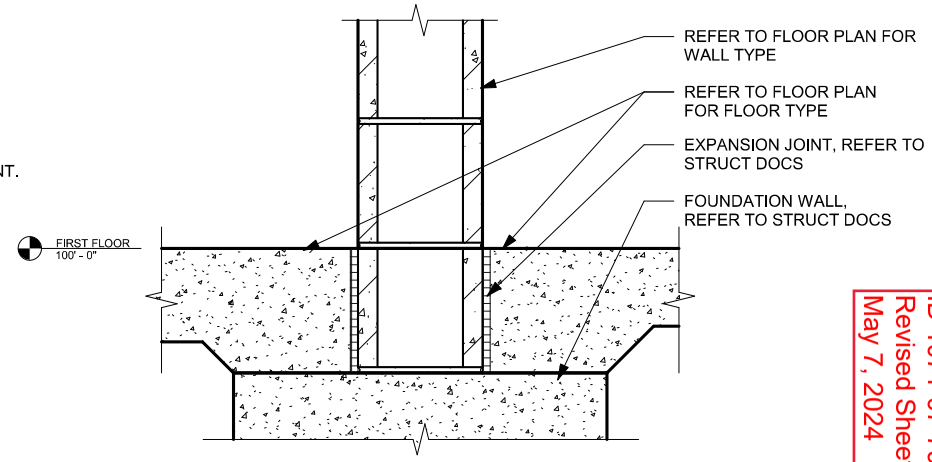
1 X1 AND X2 TRANSITION DETAIL
1 1/2" = 1'-0"



2 WALL BASE AT COLUMN DETAIL
1 1/2" = 1'-0"



3 WALL BASE AT X2 DETAIL
1 1/2" = 1'-0"

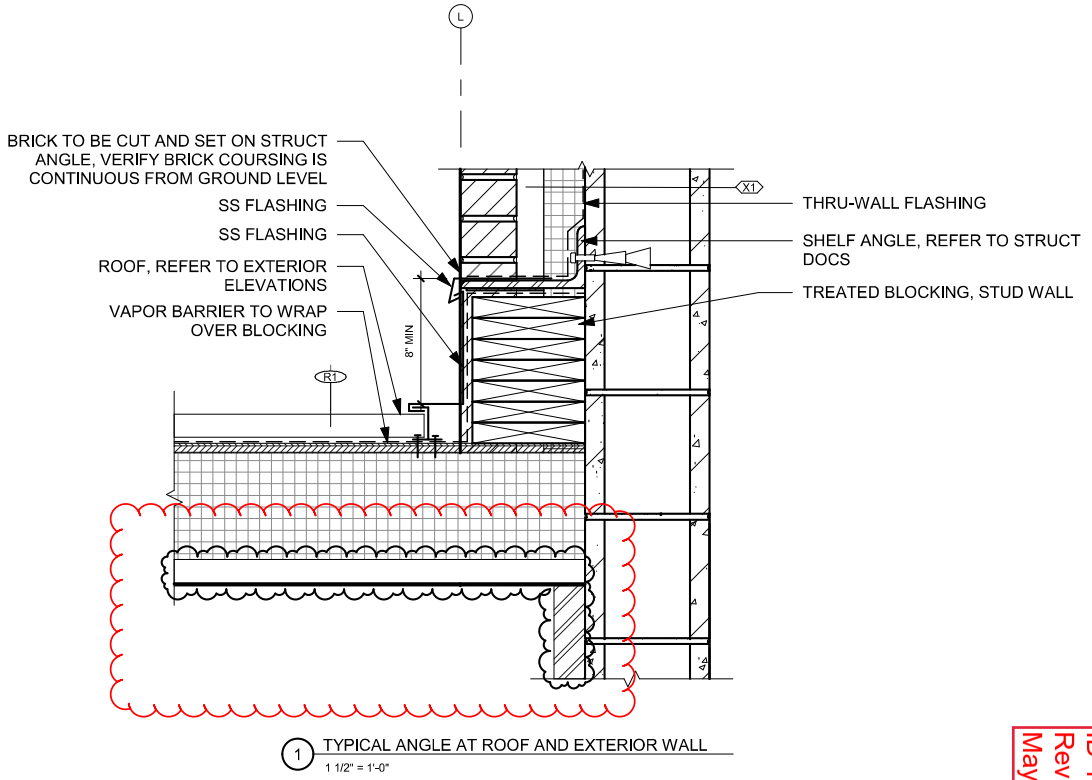


4 INTERIOR WALL AT FOUNDATION DETAIL
1 1/2" = 1'-0"

Addendum No. 01
ID 1071-07-79
Revised Sheet 91
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WALL & BASE DETAILS	SHEET NO: A3-31 91

PLOT DATE: 4/29/2024 9:30:47 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

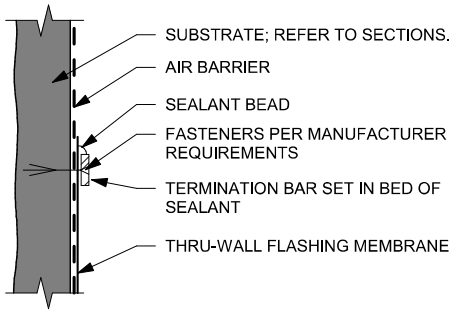


1 TYPICAL ANGLE AT ROOF AND EXTERIOR WALL
1 1/2" = 1'-0"

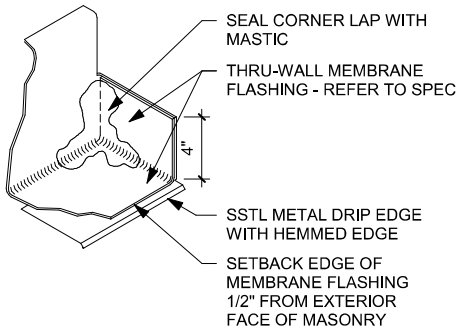
Addendum No. 01
ID 1071-07-79
Revised Sheet 94
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	ROOF DETAILS	SHEET NO: A3-34 94

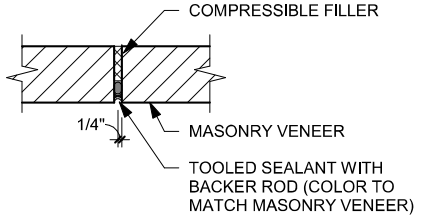
PLOT DATE: 4/29/2024 9:15:40 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



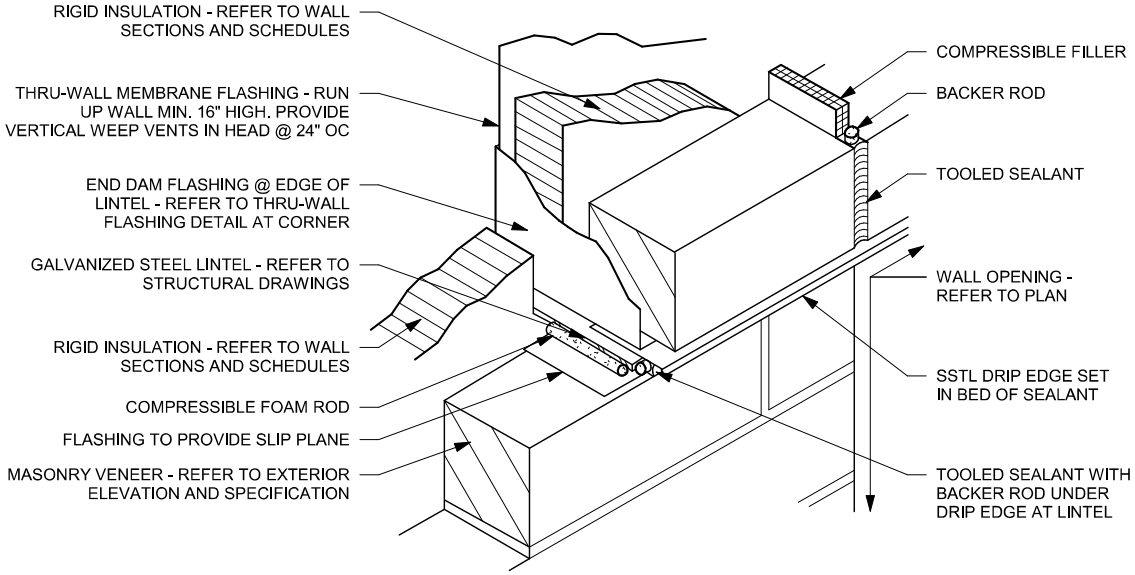
1 TERMINATION BAR DETAIL
3" = 1'-0"



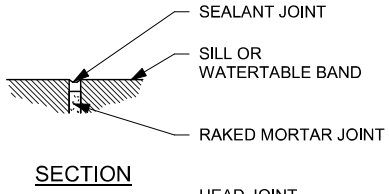
2 VENEER THRU WALL FLASHING END DAM
1 1/2" = 1'-0"



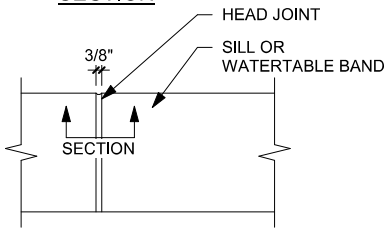
3 MASONRY VENEER CONTROL JOINT DETAIL
1 1/2" = 1'-0"



4 MASONRY VENEER CONTROL JOINT AT OPENING
1" = 1'-0"



SECTION



ELEVATION & PLAN VIEW

5 WALL CAP JOINT DETAIL
1 1/2" = 1'-0"

Addendum No. 01
ID 1071-07-79
Added Sheet 97A
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	DETAILS	SHEET NO. A3-38	97A

PLOT DATE: 4/29/2024 9:15:40 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

DOOR SCHEDULE

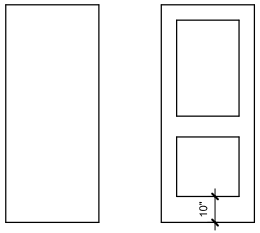
MARK	ROOM NAME	WIDTH	HEIGHT	DOOR TYPE	DOOR MATERIAL	FRAME TYPE	FRAME MATERIAL	AAOS Project HW Set	COMMENTS
001	CHASE	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	5.0	
101A	VESTIBULE	6' - 0"	7' - 10"	FG1	ALUMINUM	AL1	ALUMINUM	1.0	
101B	LOBBY	6' - 0"	7' - 10"	FG1	ALUMINUM	AL2	ALUMINUM	4.0	
103A	VESTIBULE	6' - 0"	7' - 10"	FG1	ALUMINUM	AL1	ALUMINUM	1.0	
103B	LOBBY	6' - 0"	7' - 10"	FG1	ALUMINUM	AL2	ALUMINUM	4.0	
104	TOILET RM	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	8.0	
105	TOILET RM	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	8.0	
106A	WOMEN	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	9.0	DOOR CAN BE LOCKED INTO ALTERNATE JAMB WHEN OPENED 90°
106B	WOMEN	4' - 0"	7' - 0"		HOLLOW METAL	3	HOLLOW METAL		
107A	MEN	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	9.0	DOOR CAN BE LOCKED INTO ALTERNATE JAMB WHEN OPENED 90°
107B	MEN	4' - 0"	7' - 0"		HOLLOW METAL	3	HOLLOW METAL		
108A	WOMEN	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	9.0	DOOR CAN BE LOCKED INTO ALTERNATE JAMB WHEN OPENED 90°
108B	WOMEN	4' - 0"	7' - 0"		HOLLOW METAL	3	HOLLOW METAL		
109A	MEN	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	9.0	DOOR CAN BE LOCKED INTO ALTERNATE JAMB WHEN OPENED 90°
109B	MEN	4' - 0"	7' - 0"		HOLLOW METAL	3	HOLLOW METAL		
110A	BREAKROOM	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	2.1	
110B	BREAKROOM	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	5.1	
111A	JANITOR	6' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	2.0	
111B	JANITOR	4' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	5.0	
112	TOILET RM	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	8.0	
113B	OFFICE	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	7.0	
114	OFFICE	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	7.0	
115	JANITOR	3' - 0"	7' - 0"	FL	HOLLOW METAL	2	HOLLOW METAL	6.1	

Addendum No. 01
ID 1071-07-79
Revised Sheet 99
May 7, 2024

GLAZING SCHEDULE

MARK	MATERIAL	THICKNESS	COMMENTS
G-1	TEMPERED	1/4"	INTERIOR WINDOWS, UNO
IG-1	INSULATED, TEMPERED	1"	EXTERIOR WINDOWS, UNO
IG-2	INSULATED, TEMPERED, BIRD SAFE FILM	1"	VIRACON, 1% COVERAGE 51777 BIRD FRIENDLY
IG-3	INSULATED, TEMPERED, PRIVACY FILM	1"	VIRACON, VE1- 2M

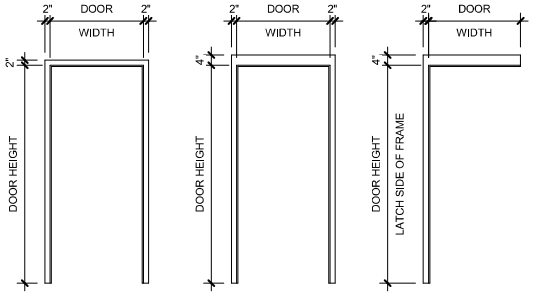
DOOR TYPE



FL
FLUSH

FG1
FULL GLASS W/ CENTER RAIL

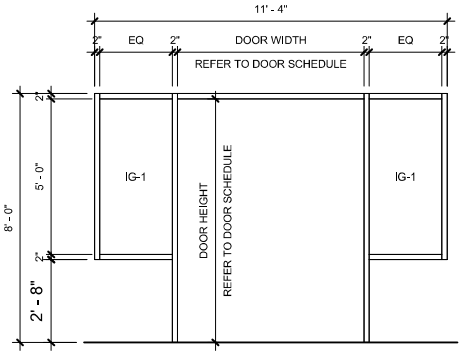
FRAME TYPES



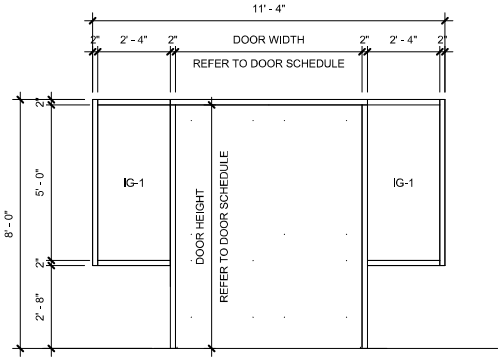
1
METAL FRAME

2
METAL FRAME W/ MASONRY HEAD

3
METAL FRAME W/ MASONRY HEAD



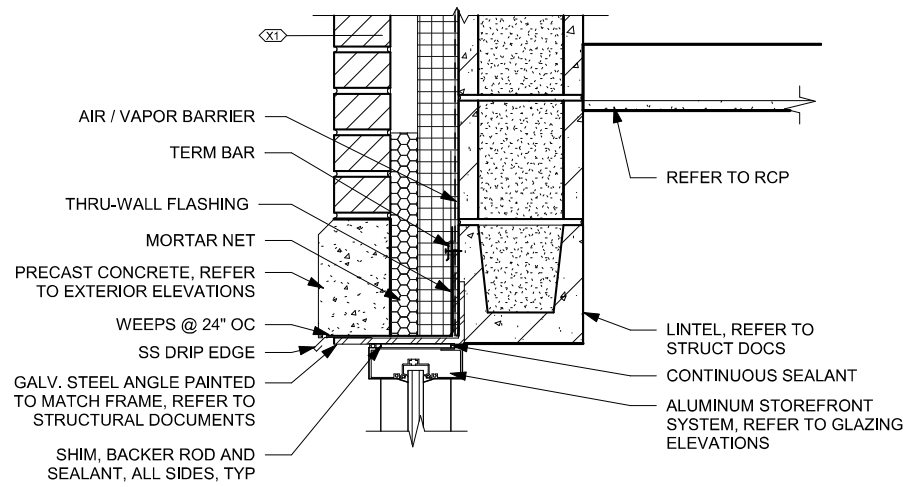
AL1



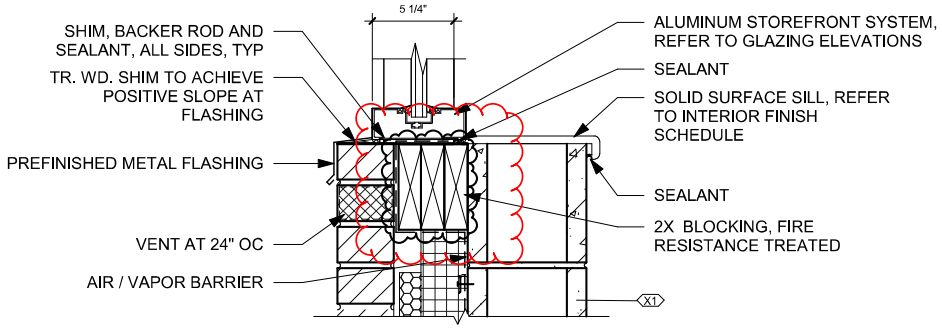
AL2

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	DOOR SCHEDULE, DOOR AND FRAME TYPES	SHEET NO: A4-11 99

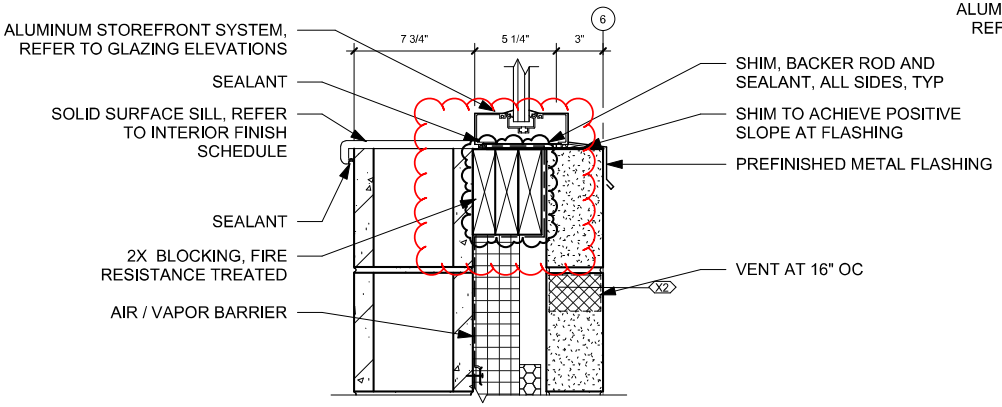
PLOT DATE: 4/29/2024 9:15:40 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



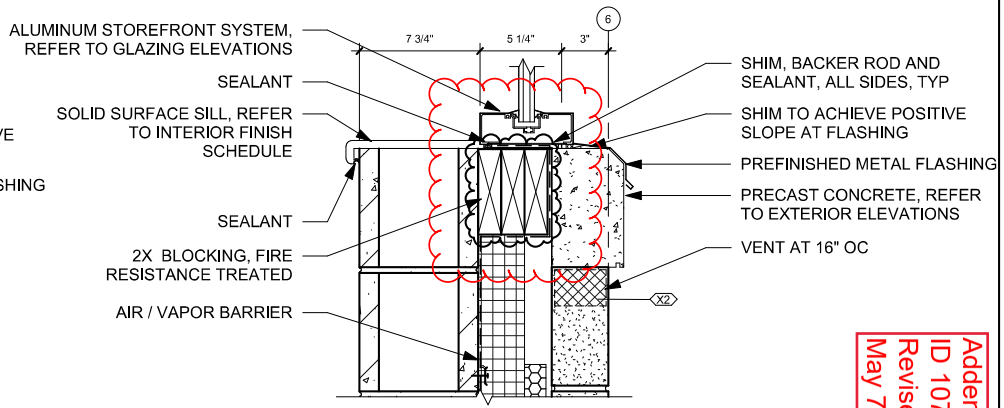
1 WINDOW HEAD AT X1 DETAIL
1 1/2" = 1'-0"



2 WINDOW SILL AT X1 DETAIL
1 1/2" = 1'-0"



3 WINDOW SILL AT X2 DETAIL
1 1/2" = 1'-0"

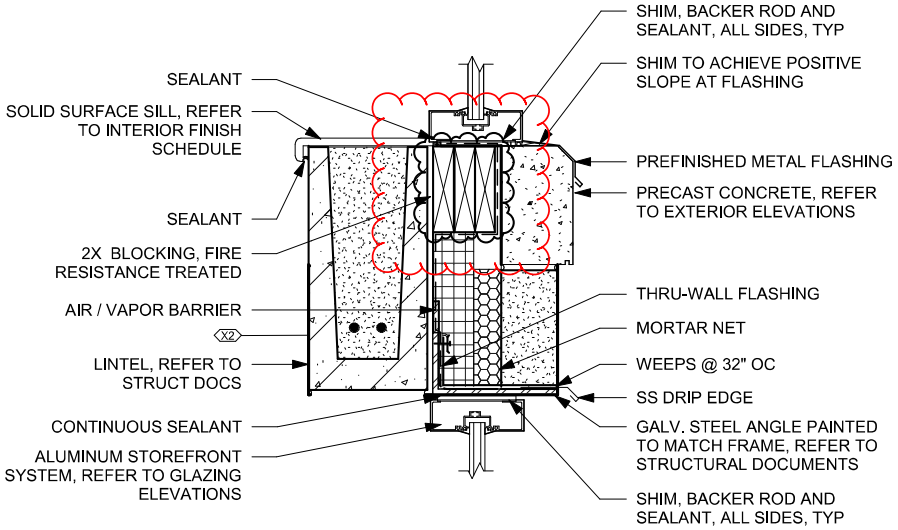


4 WINDOW SILL AT X2 TRANSITION DETAIL
1 1/2" = 1'-0"

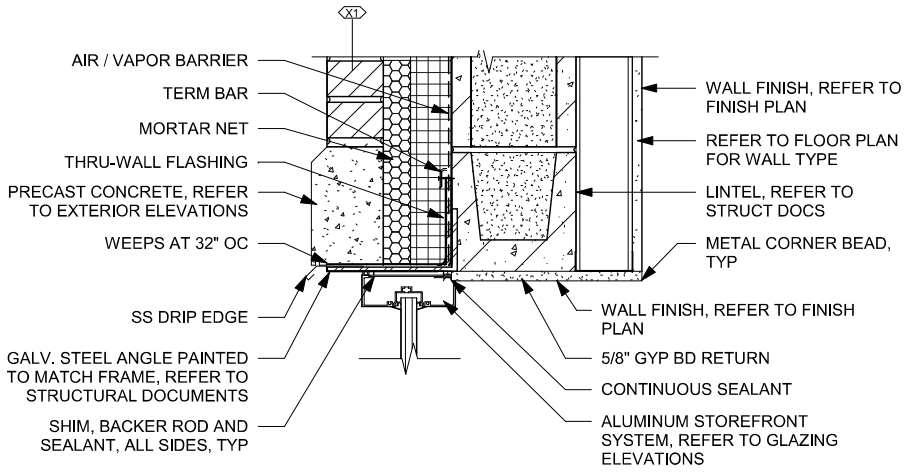
Addendum No. 01
ID 1071-07-79
Revised Sheet 102
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WINDOW DETAILS	SHEET NO: A4-21 102

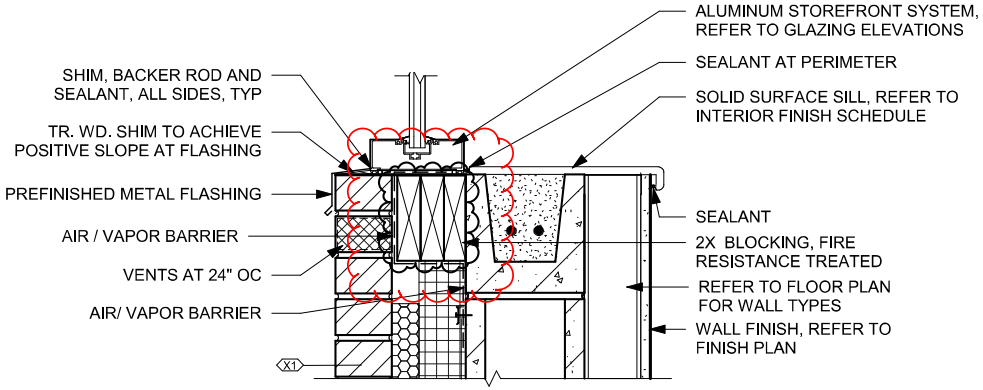
PLOT DATE: 4/29/2024 9:15:43 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



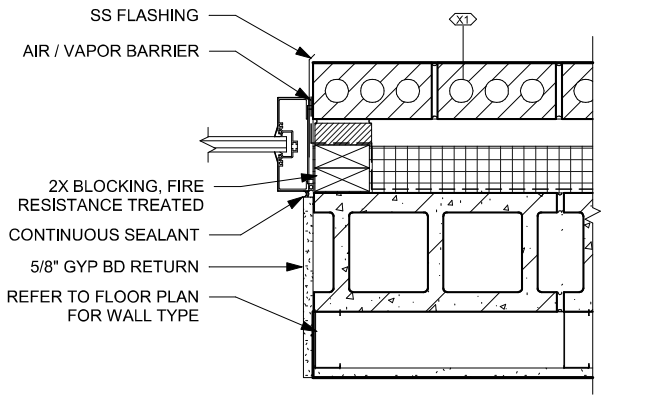
1 WINDOW HEAD AND WINDOW SILL AT X2 DETAIL
1 1/2" = 1'-0"



2 WINDOW HEAD AT X1 AND FURRED WALL DETAIL
1 1/2" = 1'-0"



3 WINDOW SILL AT X1 AND FURRED WALL DETAIL
1 1/2" = 1'-0"

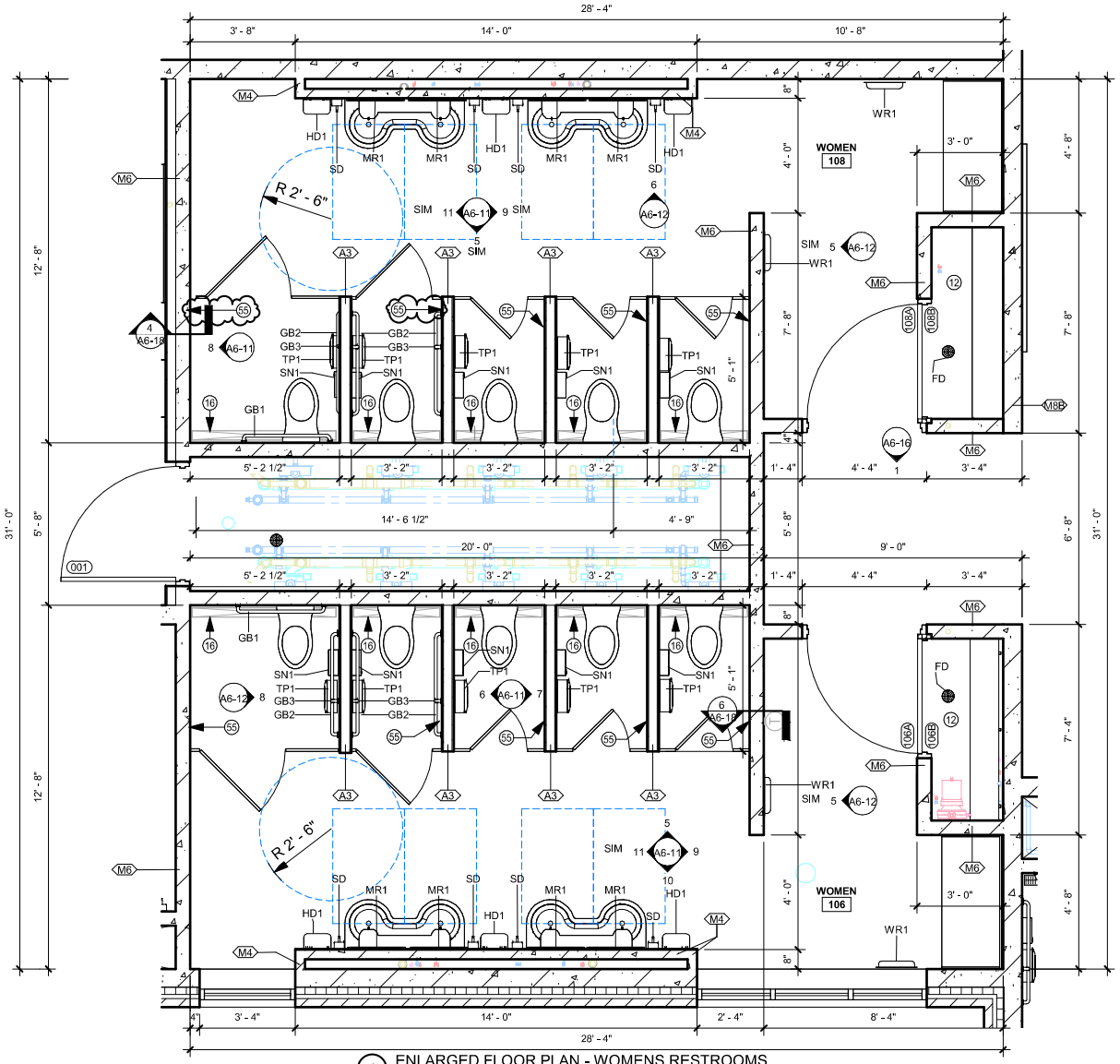


4 WINDOW JAMB AT Z1 AND FURRED WALL DETAIL
1 1/2" = 1'-0"

Addendum No. 01
ID 1071-07-79
Revised Sheet 103
May 7, 2024

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	WINDOW DETAILS	SHEET NO: A4-22 103

PLOT DATE: 4/29/2024 9:15:43 AM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



1 ENLARGED FLOOR PLAN - WOMENS RESTROOMS

1/4" = 1'-0"

EQUIPMENT SCHEDULE

MARK	DESCRIPTION	COMMENTS	PROVIDED BY	INSTALLED BY
CT	ADJUSTABLE HEIGHT CHANGING STATION	KB3000	CONTRACTOR	CONTRACTOR
GB1	GRAB BAR 36"		CONTRACTOR	CONTRACTOR
GB2	GRAB BAR 42"		CONTRACTOR	CONTRACTOR
GB3	GRAB BAR 18"		CONTRACTOR	CONTRACTOR
HD1	HAND DRYER - SURFACE MOUNTED	STAINLESS	OWNER	CONTRACTOR
MR1	MIRROR 2'W x 3'H	STAINLESS STEEL SAFTEY MIRROR	CONTRACTOR	CONTRACTOR
SD	SOAP DISPENSER		OWNER	CONTRACTOR
SH	BOBRICK RECESSED SHARP DISPOSAL		CONTRACTOR	CONTRACTOR
SN1	SANITARY NAPKIN DISPOSAL - SURFACE MOUNTED		OWNER	CONTRACTOR
TP1	TOILET TISSUE DISPENSER	MULTI ROLL	OWNER	CONTRACTOR
WR1	WASTE - RECESS MOUNTED		CONTRACTOR	CONTRACTOR

KEYNOTE LEGEND

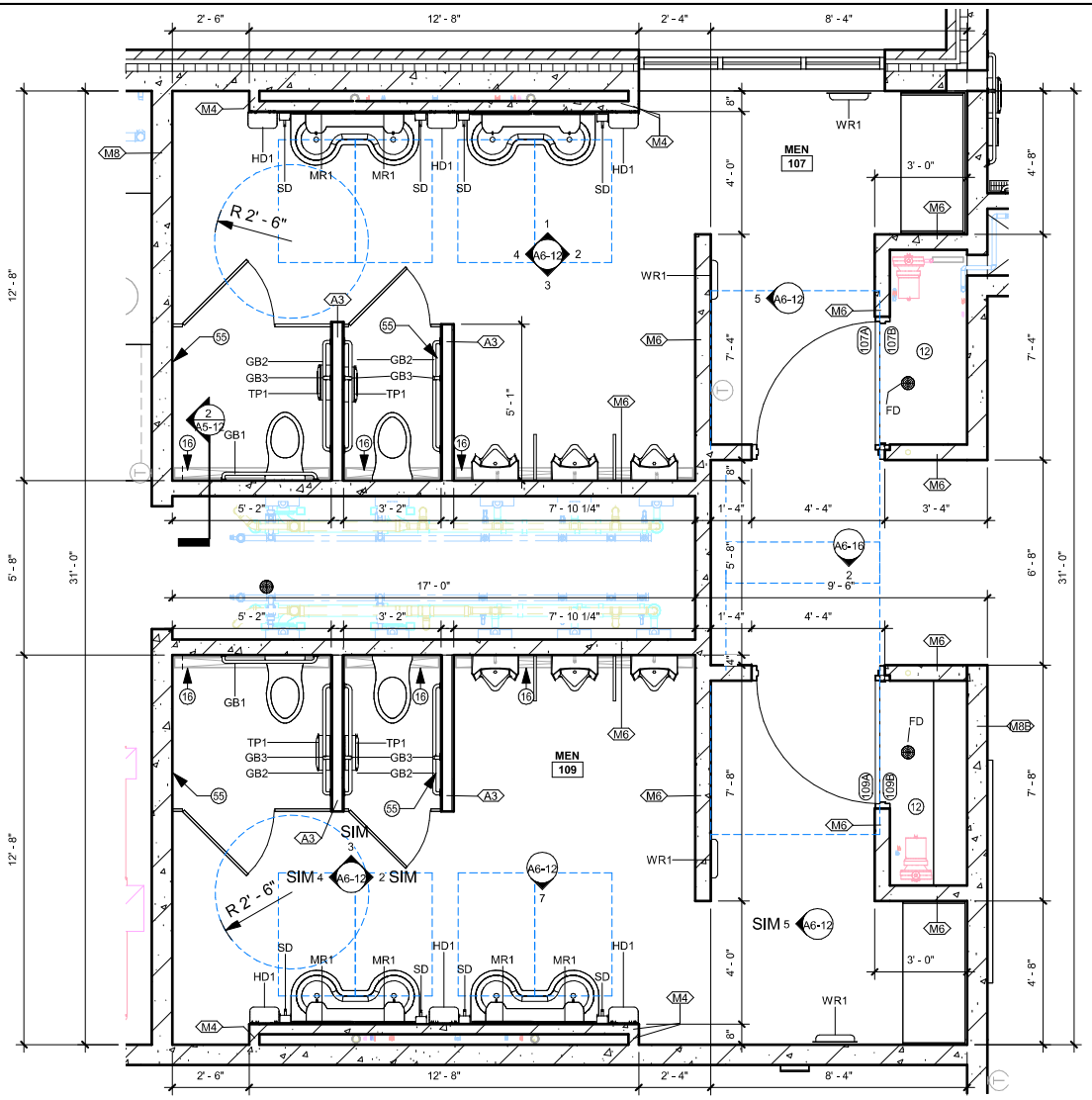
12	HOSE BIBB (HOT AND COLD) IN CLOSET.
16	TRENCH DRAIN, SEE DETAIL 2 / A5-12. REFER TO PLUMBING DOCS FOR ADDITIONAL INFORMATION
55	COAT HOOK LOCATED IN NOOK, REFER TO ELEVATIONS AND INTERIOR DETATILS FOR ADDITIONAL INFORMATION.

Addendum No. 01
ID 1071-07-79
Revised Sheet 107
May 7, 2024

N

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	ENLARGED FLOOR PLAN - WOMENS RESTROOM	SHEET NO: A5-11 107

PLOT DATE: 4/29/2024 1:58:27 PM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED



1 ENLARGED FLOOR PLAN - MENS RESTROOMS
1/4" = 1'-0"

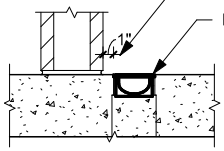
EQUIPMENT SCHEDULE

MARK	DESCRIPTION	COMMENTS	PROVIDED BY	INSTALLED BY
CT	ADJUSTABLE HEIGHT CHANGING STATION	KB3000	CONTRACTOR	CONTRACTOR
GB1	GRAB BAR 36"		CONTRACTOR	CONTRACTOR
GB2	GRAB BAR 42"		CONTRACTOR	CONTRACTOR
GB3	GRAB BAR 18"		CONTRACTOR	CONTRACTOR
HD1	HAND DRYER - SURFACE MOUNTED	STAINLESS	OWNER	CONTRACTOR
MR1	MIRROR 2'W x 3'H	STAINLESS STEEL SAFTEY MIRROR	CONTRACTOR	CONTRACTOR
SD	SOAP DISPENSER		OWNER	CONTRACTOR
SH	BOBRICK RECESSED SHARP DISPOSAL		CONTRACTOR	CONTRACTOR
SN1	SANITARY NAPKIN DISPOSAL - SURFACE MOUNTED		OWNER	CONTRACTOR
TP1	TOILET TISSUE DISPENSER	MULTI ROLL	OWNER	CONTRACTOR
WR1	WASTE - RECESS MOUNTED		CONTRACTOR	CONTRACTOR

KEYNOTE LEGEND

12	HOSE BIBB (HOT AND COLD) IN CLOSET.
16	TRENCH DRAIN, SEE DETAIL 2 / A5-12. REFER TO PLUMBING DOCS FOR ADDITIONAL INFORMATION
55	COAT HOOK LOCATED IN NOOK. REFER TO ELEVATIONS AND INTERIOR DETAILS FOR ADDITIONAL INFORMATION.

Addendum No. 01
ID 1071-07-79
Revised Sheet 108
May 7, 2024



2 TRENCH DRAIN DETAIL
1" = 1'-0"

N

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	ENLARGED FLOOR PLAN - MENS RESTROOMS	SHEET NO: A5-12 108

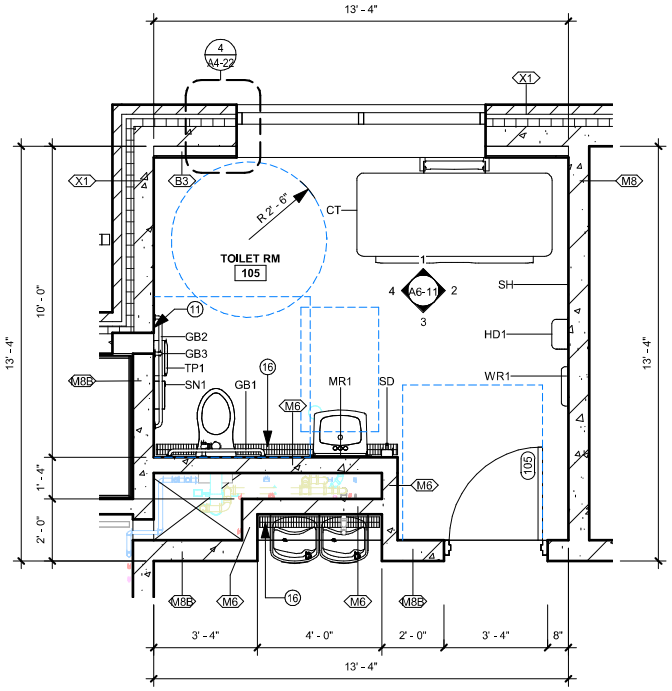
PLOT DATE: 4/29/2024 1:58:28 PM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

KEYNOTE LEGEND	
11	ALIGN EXTERIOR WALL FACE CMU WITH INTERIOR WALL FACE.
16	TRENCH DRAIN, SEE DETAIL 2 / A5-12. REFER TO PLUMBING DOCS FOR ADDITIONAL INFORMATION

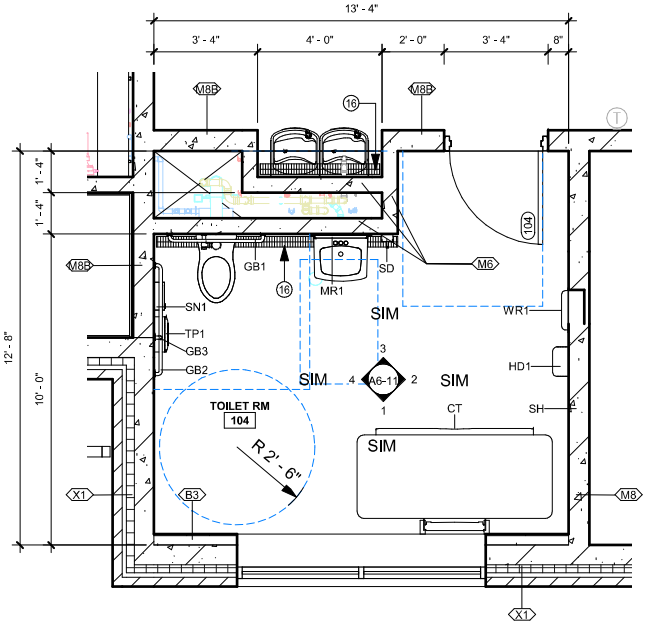
EQUIPMENT SCHEDULE

MARK	DESCRIPTION	COMMENTS	PROVIDED BY	INSTALLED BY
CT	ADJUSTABLE HEIGHT CHANGING STATION	KB3000	CONTRACTOR	CONTRACTOR
GB1	GRAB BAR 36"		CONTRACTOR	CONTRACTOR
GB2	GRAB BAR 42"		CONTRACTOR	CONTRACTOR
GB3	GRAB BAR 18"		CONTRACTOR	CONTRACTOR
HD1	HAND DRYER - SURFACE MOUNTED	STAINLESS	OWNER	CONTRACTOR
MR1	MIRROR 2'W x 3'H	STAINLESS STEEL SAFTEY MIRROR	CONTRACTOR	CONTRACTOR
SD	SOAP DISPENSER		OWNER	CONTRACTOR
SH	BOBRICK RECESSED SHARP DISPOSAL		CONTRACTOR	CONTRACTOR
SN1	SANITARY NAPKIN DISPOSAL - SURFACE MOUNTED		OWNER	CONTRACTOR
TP1	TOILET TISSUE DISPENSER	MULTI ROLL	OWNER	CONTRACTOR
WR1	WASTE - RECESS MOUNTED		CONTRACTOR	CONTRACTOR

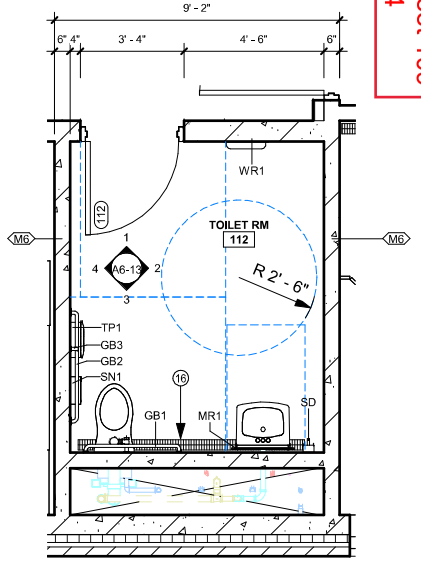
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1 ENLARGED FLOOR PLAN - TOILET RM 105
1/4" = 1'-0"



2 ENLARGED FLOOR PLAN - TOILET RM 104
1/4" = 1'-0"



3 ENLARGED FLOOR PLAN - TOILET RM 112
1/4" = 1'-0"

N

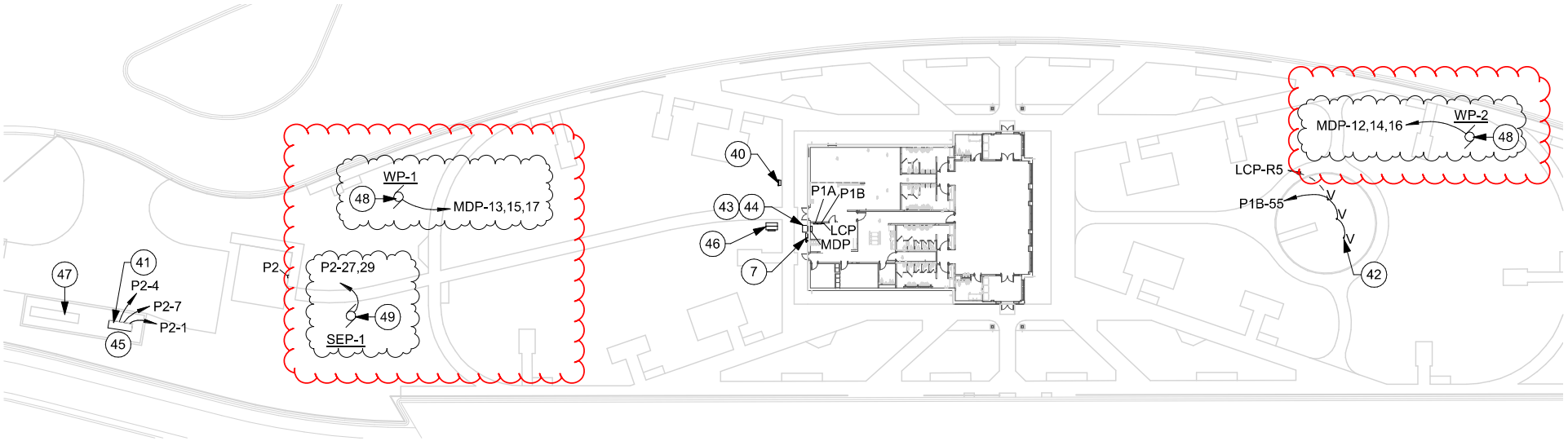
STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	ENLARGED FLOOR PLANS	SHEET NO: A5-13	109

PLOT DATE: 4/29/2024 1:58:29 PM PLOT BY: ISG INC. PLOT NAME: KSS PLOT SCALE: AS INDICATED

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ELECTRICAL KEYNOTE LEGEND

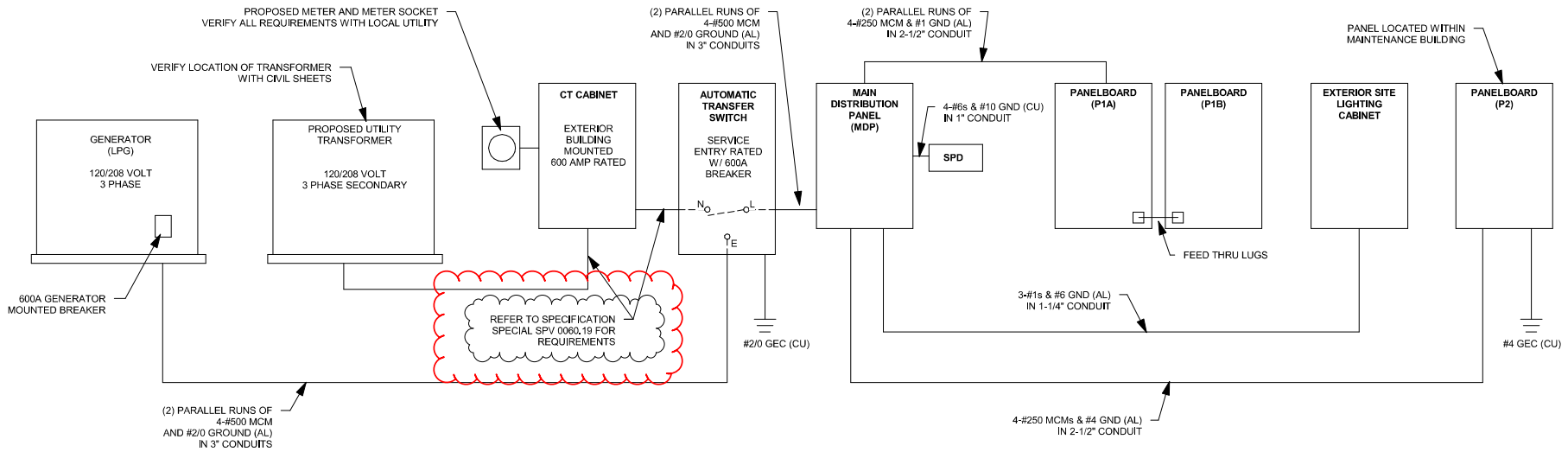
7	PROPOSED CT CABINET AND METER LOCATION. REFER TO ELECTRICAL RISER FOR DETAILS.
40	PROPOSED LOCATION FOR SITE LIGHTING CONTROL CABINET. REFER TO RISER DIAGRAM FOR CIRCUIT REQUIREMENTS. SEE CIVIL EXTERIOR LIGHTING DRAWINGS FOR CABINET REQUIREMENTS AND DETAILS.
41	F&I LPG GENERATOR, COORDINATE FINAL SITE LOCATION WITH CIVIL DRAWINGS AS LOCATION SHOWN IS DIAGRAMMATIC TO SHOW CONNECTIONS ONLY. REFER TO RISER AND SPECIFICATIONS FOR REQUIREMENTS.
42	F&I FLOOD LIGHTS FOR FLAG POLE LOCATIONS. MOUNTING BASE SHALL BE OFFSET 5' FROM FLAG POLE BASE. CIRCUIT TO BE ROUTED THROUGH LIGHTING CONTACTOR. SEE DETAILS FOR MOUNTING BASE REQUIRMENTS.
43	EXTERIOR BUILDING MOUNTED AUTOMATIC TRANSFER SWITCH. REFER TO ELECTRICAL RISER AND SPECIFICATIONS FOR REQUIREMENTS.
44	PROVIDE 1" CONDUIT WITH GENERATOR SUPPLIER RECOMMENDED WIRING FOR START/STOP SIGNAL FROM ATS TO GENERATOR CONTROLS.
45	PROVIDE CIRCUITS FOR GENERATOR CIRCUIT BREAKER, BATTERY CHARGER, AND ENGINE BLOCK HEATER.
46	PROPOSED UTILITY TRANSFORMER LOCATION. CONFIRM LOCATION WITH CIVIL DRAWINGS.
47	PROVIDE 1" CONDUIT WITH (2) #18 AWG SHIELDED TWISTED PAIR, BELDEN 8770 OR EQUAL, AND (4) #14 AWG CONDUCTORS FROM LP TANK SENSOR TO REMOTE MOUNTED CONTROLS IN TEST AREA BUILDING. CONFIRM WIRE/CABLES NEEDED WITH LP MONITOR AND CONTROLS SUPPLIER. CONFIRM MOUNTED LOCATION OF CONTROLS WITHIN REST AREA BUILDING WITH SYSTEM INSTALLER.
48	APPROXIMATE LOCATION FOR WELL PUMP. REFER TO SITE PLANS FOR ACTUAL LOCATIONS OF WELLS.
49	APPROXIMATE LOCATION FOR SEWAGE EJECTOR PUMP.



1 ELECTRICAL SITE PLAN
1" = 50'-0"

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	ELECTRICAL SITE PLAN	SHEET NO: E2-00	195 E

PLOT DATE: 4/29/2024 3:00:42 PM PLOT BY: ISG INC. PLOT NAME: RDS PLOT SCALE: AS INDICATED



1 ELECTRICAL RISER DIAGRAM
NOT TO SCALE

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Distrib. Panel: MDP

Location: ELECT / IT 115
Supply From:
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 35 kAIC
Mains Type: MLO
Mains Rating: 600 A
MCB Rating: 600 A

Notes:

CKT	Circuit Description	Trip	Pole	A		B		C		Pole	Trip	Circuit Description	CKT
1				50103	13920								2
3	PANELS P1A & P1B	400 A	3			50152	14488			3	200 A	PANEL P2	4
5								49826	14571				6
7				0	5000								8
9	SURGE PROTECTIVE DEVICE (SPD)	60 A	3			0	5000			2	100 A	EXTERIOR LIGHTING CABINET	10
11								0	3699				12
13				3699	3699					3	40 A	WELL PUMP #2	14
15	WELL PUMP #1	40 A	3			3699	3699						16
17								3699	--	1	-	BLANK	18
		Total Load:		76420 VA		77037 VA		71793 VA					
		Total Amps:		643 A		648 A		598 A					

Legend:

Load Classification	Connected Load	Demand Factor	Estimated...	Panel Totals	
HVAC	101151 VA	100.00%	101151 VA		
Heating	34500 VA	100.00%	34500 VA	**Total Conn. Load:**	225246 VA
Lighting	4785 VA	100.00%	4785 VA	**Total Est. Demand:**	220806 VA
Lighting - Exterior	76 VA	100.00%	76 VA	**Total Conn.:**	625 A
Motor	26772 VA	100.00%	26772 VA	**Total Est. Demand:**	613 A
Other	2706 VA	100.00%	2706 VA		
Power	26550 VA	100.00%	26550 VA		
Receptacle	18880 VA	76.48%	14440 VA		
Spare	10000 VA	100.00%	10000 VA		

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Branch Panel: P2

Location: Space 11
Supply From: MDP
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10 kAIC
Mains Type: MCB
Mains Rating: 200 A
MCB Rating: 200 A

Notes:

CKT	Circuit Description	Trip	Pole	A		B		C		Pole	Trip	Circuit Description	CKT
1	RCPT - GENERATOR	20 A	1	180	500					1	20 A	MECH/BLDG CONTROL PANEL	2
3	LIGHTING	20 A	1			270	1200			1	20 A	GEN ENGINE HEATER	4
5	RCPTS - EAST WALL/EXT.	20 A	1					540	1000	1	20 A	GARAGE DOOR	6
7	GENERATOR BATTERY...	20 A	1	1200	540					1	20 A	RCPTS - NORTH WALL	8
9	EXHAUST FAN	15 A	2			250	540			1	20 A	RCPTS - SOUTH WALL	10
11								250	540	1	20 A	RCPTS - SW WALL/EXTERIOR	12
13	ELECTRIC WATER HEATER (EWH-1)	20 A	3	1500	5000					3	60 A	ELECTRIC UNIT HEATER (EUH-1)	14
15						1500	5000						16
17								1500	5000				18
19	ELECTRIC UNIT HEATER (EUH-2)	60 A	3	5000	0					1	20 A	SPARE	20
21						5000	0			1	20 A	SPARE	22
23								5000	0	1	20 A	SPARE	24
25	BLANK	--	1	--						1	--	BLANK	26
27	SEWAGE EJECTOR PUMP	20 A	2			790	--			1	--	BLANK	28
29								790	--	1	--	BLANK	30
		Total Load:		13920 VA		14488 VA		14571 VA					
		Total Amps:		116 A		121 A		122 A					

Legend:

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ELECTRICAL EQUIPMENT SCHEDULE

ITEM#	DESCRIPTION	POWER REQUIREMENTS					WIRE #SIZE, GND, MINIMUM CONDUIT	STARTER		DISCONNECT		NOTES
		HP	VOLTS	POLES	FLA	VA		TYPE	BY	TYPE	BY	
CU-1	CONDENSING UNIT		208 V	3	16.0 A	5764 VA	3/4"C, 3- 10's, 10GND	(none)	(none)	NF	EC	
DR-1	ELECTRIC DRYER		208 V	2	0.0 A	5000 VA	3/4"C, 3- 10's, 10GND	(none)	(none)	(none)	(none)	
EF-1	EXHAUST FAN	1/6	208 V	2	0.0 A	500 VA	3/4"C, 2- 12's, 12GND	COMB	EC	NF	EC	INTERLOCK WITH CO/NO CONTROLS AND LOUVER
ERV-1R	ENERGY RECOVERY UNIT RETURN FAN		208 V	3	6.6 A	2378 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	EC	
ERV-1S	ENERGY RECOVERY UNIT SUPPLY FAN		208 V	3	6.6 A	2378 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	EC	
ERV-1W	ENERGY RECOVERY UNIT ENERGY WHEEL		208 V	3	0.7 A	252 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	EC	
EUH-1	ELECTRIC UNIT HEATER		208 V	3	0.0 A	15000 VA	1"C, 3- 6's, 10GND	(none)	(none)	NF	ES	
EUH-2	ELECTRIC UNIT HEATER		208 V	3	0.0 A	15000 VA	1"C, 3- 6's, 10GND	(none)	(none)	NF	ES	
EWH-1	ELECTRIC WATER HEATER		208 V	3	0.0 A	4500 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	EC	
HPWH-1	WATER HEAT PUMP		208 V	3	53.0 A	19094 VA	1-1/4"C, 3- 4's, 8GND	(none)	(none)	NF	EC	
PGW-1	GEO PUMP	7-1/2	208 V	3	0.0 A	8646 VA	3/4"C, 3- 8's, 10GND	VFD	ES	NF	ES	INSTALL SUPPLIER PROVIDED VFD AND DISCONNECT. PROVIDE ALL TERMINATIONS/CONNECTIONS.
PGW-2	GEO PUMP	7-1/2	208 V	3	0.0 A	8646 VA	3/4"C, 3- 8's, 10GND	VFD	ES	NF	ES	INSTALL SUPPLIER PROVIDED VFD AND DISCONNECT. PROVIDE ALL TERMINATIONS/CONNECTIONS.
PHW-1	HOT WATER PUMP	1/2	208 V	2	0.0 A	1125 VA	3/4"C, 2- 12's, 12GND	(none)	(none)	NF	EC	
PHW-2	HOT WATER PUMP	1/2	208 V	2	0.0 A	1125 VA	3/4"C, 2- 12's, 12GND	(none)	(none)	NF	EC	
PHW-3	HOT WATER PUMP	1/6	120 V	1	0.0 A	528 VA	3/4"C, 2- 12's, 12GND	(none)	(none)	NF	EC	
PHW-4	HOT WATER PUMP	1/2	208 V	2	0.0 A	1125 VA	3/4"C, 2- 12's, 12GND	(none)	(none)	NF	EC	
RCP-1	HOT WATER RECIRC PUMP	1/12	120 V	1	0.0 A	60 VA	3/4"C, 2- 12's, 12GND	(none)	(none)	NF	EC	
SEP-1	SEWAGE EJECTOR PUMP	3/4	208 V	2	5.5 A	1580 VA	1"C, 2- 10's, 10GND	(none)	(none)	NF	EC	
WP-1	WELL PUMP	10	208 V	3	30.0 A	11096 VA	1"C, 3- 6's, 8GND	VFD	ES	NF	EC	
WP-2	WELL PUMP	10	208 V	3	30.0 A	11096 VA	1"C, 3- 6's, 8GND	VFD	ES	NF	EC	
WSHP-1	WATER SOURCE HEAT PUMP		208 V	3	11.0 A	3962 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	WU	
WSHP-2	WATER SOURCE HEAT PUMP		208 V	3	30.0 A	10807 VA	3/4"C, 3- 8's, 10GND	(none)	(none)	NF	WU	
WSHP-3	WATER SOURCE HEAT PUMP		208 V	3	30.0 A	10807 VA	3/4"C, 3- 8's, 10GND	(none)	(none)	NF	WU	
WSHP-4	WATER SOURCE HEAT PUMP		208 V	3	11.0 A	3962 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	WU	
WSHP-5	WATER SOURCE HEAT PUMP		208 V	3	21.0 A	7565 VA	3/4"C, 3- 10's, 10GND	(none)	(none)	NF	WU	
WSHP-6	WATER SOURCE HEAT PUMP		208 V	3	11.0 A	3962 VA	3/4"C, 3- 12's, 12GND	(none)	(none)	NF	WU	
WWHP-1	WATER TO WATER HEAT PUMP		208 V	3	21.0 A	7565 VA	3/4"C, 3- 8's, 10GND	(none)	(none)	NF	EC	

STARTER TYPE	
COMB	COMBINATION STARTER
ECM	ELECTRONICALLY CONTROLLED MOTOR
MAG	MAGNETIC STARTER
MAN	MANUAL STARTER
SS	SOFT STARTER
VFD	VARIABLE FREQUENCY DRIVE

STARTER BY	
EC	ELECTRICAL CONTRACTOR
ES	EQUIPMENT SUPPLIER
MC	MECHANICAL CONTRACTOR
WU	WITH UNIT

DISCONNECT TYPE	
BO	BY OTHERS
F	FUSED DISCONNECT
NF	NON-FUSED DISCONNECT

DISCONNECT BY	
EC	ELECTRICAL CONTRACTOR
ES	EQUIPMENT SUPPLIER
MC	MECHANICAL CONTRACTOR
WU	WITH UNIT

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MOBILIZATIONS EROSION CONTROL

PROJECT	CATEGORY	LOCATION	628.1905 MOBILIZATIONS EROSION CONTROL (EACH)	628.1910 MOBILIZATIONS EMERGENCY EROSION CONTROL (EACH)
1071-07-79				
	0010	PROJECT 1071-07-79	22	16
PROJECT 1071-07-79 TOTAL			22	16

TREES

PROJECT	CATEGORY	LOCATION	STATION - STATION	632.0101.01 OCCIDENTALIS 'CHICAGOLAND' CHICAGOLAND HACKBERRY, 2.5" CAL, B&B (EACH)	632.0101.02 TRIACANTHOS INERMIS 'SKYCOLE' SKYLINE HONEY LOCUST, 2.5" CAL, B&B (EACH)	632.0101.03 QUERCUS ALBA WHITE OAK, 2.5" CAL, B&B (EACH)	632.0101.04 QUERCUS BICOLOR SWAMP WHITE OAK, 2.5" CAL, B&B (EACH)
1071-07-79							
	0010	REST AREA PLAZA	1183+10 RB - 1192+70 RB	9	6	6	4
PROJECT 1071-07-79 TOTAL				9	6	6	4

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TEMPORARY PAVEMENT MARKING

PROJECT	CATEGORY	LOCATION	STATION - STATION	643.3170 TEMPORARY MARKING LINE EPOXY 6-INCH (WHITE) (LF)
1071-07-79				
	0010	IH 90	1209+51 WB - 1215+53 WB	610
PROJECT 1071-07-79 TOTAL				610

PERMANENT SIGNING TYPE II

SIGN #	SIGN CODE	SIGN SIZE	SIGN SIZE WXH IN	637.2210 SIGNS TYPE II REFLECTIVE H SF	634.0612 POSTS WOOD 4X6-INCH 12 FT EACH	634.0614 POSTS WOOD 4X6-INCH 14 FT EACH	SIGN MOUNTED ON/SAME POST AS	REMARKS
CAT. 0010								
6-01	R55-64B	2S	24X24	4.00	---	1	6-02	PET WALKING AREA LEFT ARROW END OF PARKING AREA
6-02	R55-51	2S	18X18	2.25	---	---	6-01	NO OVERNIGHT CAMPING
6-03	R55-64BR	2S	24X24	4.00	---	1	6-04	PET WALKING AREA RIGHT ARROW END OF PARKING AREA
6-04	R55-51	2S	18X18	2.25	---	---	6-03	NO OVERNIGHT CAMPING
6-05	R55-64BR	2S	24X24	4.00	---	1	---	PET WALKING AREA RIGHT ARROW END OF PARKING AREA
6-06	R55-64B	2S	24X24	4.00	---	1	---	PET WALKING AREA LEFT ARROW END OF PARKING AREA
6-07	R55-64BR	2S	24X24	4.00	---	1	---	PET WALKING AREA RIGHT ARROW END OF PARKING AREA
6-08	R55-64B	2S	24X24	4.00	---	1	---	PET WALKING AREA LEFT ARROW END OF PARKING AREA
6-09	R7-8A	2S	12X18	1.50	1	---	---	RESERVED PARKING HANDICAPPED, THIS SPACE
6-10	R7-8A	2S	12X18	1.50	1	---	---	RESERVED PARKING HANDICAPPED, THIS SPACE
6-11	R7-8A	2S	12X18	1.50	1	---	---	RESERVED PARKING HANDICAPPED, THIS SPACE
6-12	R55-64B	2S	24X24	4.00	---	1	---	PET WALKING AREA LEFT ARROW END OF PARKING AREA
6-13	R7-8A	2S	12X18	1.50	1	---	---	RESERVED PARKING HANDICAPPED, THIS SPACE
6-14	R55-64BR	2S	24X24	4.00	---	1	---	PET WALKING AREA RIGHT ARROW END OF PARKING AREA
6-15	R55-64B	2S	24X24	4.00	---	1	---	PET WALKING AREA LEFT ARROW END OF PARKING AREA
6-16	R55-64BR	2S	24X24	4.00	---	1	---	PET WALKING AREA RIGHT ARROW END OF PARKING AREA
6-17	R55-64B	2S	24X24	4.00	---	1	---	PET WALKING AREA LEFT ARROW END OF PARKING AREA
6-18	R55-65	2S	24X24	4.00	---	1	6-19	PET WALKING AREA
6-19	R55-51	2S	18X18	2.25	---	---	6-18	NO OVERNIGHT CAMPING
6-20	R55-65	2S	24X24	4.00	---	1	6-21	PET WALKING AREA
6-21	R55-51	2S	18X18	2.25	---	---	6-20	NO OVERNIGHT CAMPING
6-22	R55-65	2S	24X24	4.00	---	1	6-23	PET WALKING AREA
6-23	R55-51	2S	18X18	2.25	---	---	6-22	NO OVERNIGHT CAMPING
				73.25	4	14		
PROJECT TOTALS:				**73.25**	**4**	**14**		

SHRUBS

PROJECT	CATEGORY	LOCATION	STATION - STATION	632.0201.01 MELANOCARPA VAR. ELATAGLOSSY BLACK CHOKEBERRY, 12" HT, CONT (EACH)	632.0201.02 CEANOTHUS AMERICANUS NEW JERSEY TEA, 12" HT, CONT (EACH)	632.0201.03 DASIPHORA FRUTICOSA BUSH CINQUEFOIL, 12" HT, CONT (EACH)	632.0201.04 DIERVILLA LONICERA DWARF BUSH HONEYSUCKLE, 12" HT, CONT (EACH)	632.0201.05 RIBES AMERICANUM AMERICAN BLACK CURRANT, 12" HT, CONT (EACH)	632.0201.06 SYMPHORICARPOS ALBUS COMMON SNOWBERRY, 12" HT, CONT (EACH)	632.0201.07 ANAPHALIS MARGARITACEA PEARLY EVERLASTING, DP 50, PLUG (EACH)	632.0201.08 ASCLEPIAS TUBEROSA BUTTERFLY MILKWEED, DP 50, PLUG (EACH)
1071-07-79											
	0010	REST AREA PLAZA	1183+10 RB - 1192+70 RB	12	18	3	9	14	24	28	74
PROJECT 1071-07-79 TOTAL				12	18	3	9	14	24	28	74

SHRUBS (CONT'D.)

PROJECT	CATEGORY	LOCATION	STATION - STATION	632.0201.09 ASCLEPIAS VERTICILLATA WHORLED MILKWEED, DP 50, PLUG (EACH)	632.0201.10 BOUTELOUA CURTIPENDULA SIDE OATS GRAMA, DP 50, PLUG (EACH)	632.0201.11 BOUTELOUA GRACILIS BLUE GRAMA GRASS, DP 50, PLUG (EACH)	632.0201.12 DALEA PURPUREA PURPLE PRAIRIE CLOVER, DP 50, PLUG (EACH)	632.0201.13 ECHINACEA ANGUSTIFOLIA NARROW LEAF CONEFLOWER, DP 50, PLUG (EACH)	632.0201.14 FRAGARIA VESCA WOODLAND STRAWBERRY, DP 50, PLUG (EACH)	632.0201.15 HEUCHERA RICHARDSONII PRAIRIE ALUM ROOT, DP 50, PLUG (EACH)	632.0201.16 MONARDA FISTULOSA BERGAMOT, DP 50, PLUG (EACH)	632.0201.17 SCHIZACHYRIUM SCOPARIUM LITTLE BLUESTEM, DP 50, PLUG (EACH)	632.0201.18 SPOROBOLUS HETEROLEPIS PRAIRIE DROPSEED, DP 50, PLUG (EACH)	632.0201.19 SYMPHYOTRICHUM SERICEUM SILKY ASTER, DP 50, PLUG (EACH)
1071-07-79														
	0010	REST AREA PLAZA	1183+10 RB - 1192+70 RB	72	48	31	48	50	86	92	41	31	39	38
PROJECT 1071-07-79 TOTAL				72	48	31	48	50	86	92	41	31	39	38

PLANTING ITEMS

PROJECT	CATEGORY	LOCATION	STATION - STATION	SPV.0060.07 PLANTING CONTAINER (EACH)	SPV.0165.01 UNIT PAVING (SF)
1071-07-79					
	0010	REST AREA PLAZA	1183+10 RB - 1192+70 RB	4	773
PROJECT 1071-07-79 TOTAL				4	773

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3

3

LIGHTING CONTROL

CABINET NUMBER	STATION	OFFSET	R/L	650.8501 CONSTRUCTION STAKING ELECTRICAL INSTALLATIONS (1071-07-79) EACH	654.0230 CONCRETE CONTROL CABINET BASES TYPE L30 EACH	659.2130 LIGHTING CONTROL CABINETS 120/240 30-INCH EACH
CATEGORY 0010						
CB100	1187+29'RB'	129.7'	LT	1	1	1
PROJECT TOTAL				**1**	**1**	**1**

STREET LIGHTS

LIGHT NUMBER	STATION	OFFSET	R/L	654.0105 CONCRETE BASES TYPE 5 EACH
CATEGORY 0010				
SL 105	1184+34'RB'	11.8'	LT	1
SL 106	1186+47'RB'	29.1'	LT	1
SL 107	1188+59'RB'	31.1'	LT	1
SL 108	1180+76'RA	30.5'	LT	1
PROJECT TOTAL				**4**

WALKWAY LIGHTING ITEMS

LIGHT UNIT	STATION	OFFSET	R/L	654.0111 CONCRETE BASES TYPE 11 EACH	659.0700 LIGHTING UNITS WALKWAY EACH	655.0610 ELECTRICAL WIRE LIGHTING 12 AWG LF
CATEGORY 0010						
WL 100	1186+91'RB'	163.3'	LT	1	1	72
WL 101	1187+85'RB'	171.5'	LT	1	1	72
WL 102	1188+37'RB'	182.0'	LT	1	1	72
WL 103	1189+02'RB'	173.1'	LT	1	1	72
WL 104	1189+48'RB'	153.2'	LT	1	1	72
WL 105	1190+12'RB'	151.2'	LT	1	1	72
WL 106	1190+34'RB'	105.8'	LT	1	1	72
WL 107	1191+17'RB'	98.3'	LT	1	1	72
WL 108	1188+79'RB'	132.3'	LT	1	1	72
WL 109	1189+55'RB'	115.6'	LT	1	1	72
WL 110	1188+79'RB'	87.8'	LT	1	1	72
WL 111	1190+15'RB'	55.7'	LT	1	1	72
WL 112	1189+59'RB'	54.0'	LT	1	1	72
WL 113	1189+02'RB'	42.6'	LT	1	1	72
WL 114	1188+37'RB'	34.6'	LT	1	1	72
WL 115	1187+86'RB'	42.9'	LT	1	1	72
WL 116	1187+30'RB'	54.3'	LT	1	1	72
WL 117	1186+78'RB	112.1'	LT	1	1	72
WL 118	1185+89'RB'	92.0'	LT	1	1	72
WL 119	1184+85'RB'	72.3'	LT	1	1	72
PROJECT TOTAL				**20**	**20**	**1,440**

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0002	201.0205 Grubbing	10.000 STA	_____.____	_____.____
0004	203.0100 Removing Small Pipe Culverts	1.000 EACH	_____.____	_____.____
0006	204.0100 Removing Concrete Pavement	726.000 SY	_____.____	_____.____
0008	204.0170 Removing Fence	76.000 LF	_____.____	_____.____
0010	204.0265 Abandoning Wells	1.000 EACH	_____.____	_____.____
0012	205.0100 Excavation Common	2,961.000 CY	_____.____	_____.____
0014	208.0100 Borrow	10,324.000 CY	_____.____	_____.____
0016	213.0100 Finishing Roadway (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0018	305.0110 Base Aggregate Dense 3/4-Inch	1,080.000 TON	_____.____	_____.____
0020	305.0120 Base Aggregate Dense 1 1/4-Inch	290.000 TON	_____.____	_____.____
0022	312.0110 Select Crushed Material	182.000 TON	_____.____	_____.____
0024	522.1015 Apron Endwalls for Culvert Pipe Reinforced Concrete 15-Inch	1.000 EACH	_____.____	_____.____
0026	531.2036 Drilling Shaft 36-Inch	10.000 LF	_____.____	_____.____
0028	531.4050 Foundation Camera Pole 50-FT	1.000 EACH	_____.____	_____.____
0030	601.0115 Concrete Curb Type G	160.000 LF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0032	602.0415 Concrete Sidewalk 6-Inch	31,000.000 SF	_____.____	_____.____
0034	602.0505 Curb Ramp Detectable Warning Field Yellow	52.000 SF	_____.____	_____.____
0036	602.0815 Concrete Driveway 7-Inch	770.000 SY	_____.____	_____.____
0038	606.0200 Riprap Medium	7.000 CY	_____.____	_____.____
0040	608.0315 Storm Sewer Pipe Reinforced Concrete Class III 15-Inch	162.000 LF	_____.____	_____.____
0042	611.0645 Inlet Covers Type MS-A	2.000 EACH	_____.____	_____.____
0044	611.3901 Inlets Median 1 Grate	2.000 EACH	_____.____	_____.____
0046	615.1000 Wisconsin Historical Marker	1.000 EACH	_____.____	_____.____
0048	616.0206 Fence Chain Link 6-FT	220.000 LF	_____.____	_____.____
0050	616.0329 Gates Chain Link (width) 01. 6-FT	2.000 EACH	_____.____	_____.____
0052	616.0329 Gates Chain Link (width) 02. 4-FT	2.000 EACH	_____.____	_____.____
0054	616.0700.S Fence Safety	1,000.000 LF	_____.____	_____.____
0056	618.0100 Maintenance and Repair of Haul Roads (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0058	619.1000 Mobilization	1.000 EACH	_____.____	_____.____
0060	623.0200 Dust Control Surface Treatment	5,300.000 SY	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0062	624.0100 Water	24.000 MGAL	_____.____	_____.____
0064	625.0100 Topsoil	500.000 SY	_____.____	_____.____
0066	625.0500 Salvaged Topsoil	10,200.000 SY	_____.____	_____.____
0068	627.0200 Mulching	8,100.000 SY	_____.____	_____.____
0070	628.1104 Erosion Bales	60.000 EACH	_____.____	_____.____
0072	628.1530.S Silt Fence Heavy Duty	3,000.000 LF	_____.____	_____.____
0074	628.1535.S Silt Fence Heavy Duty Maintenance	9,000.000 LF	_____.____	_____.____
0076	628.1905 Mobilizations Erosion Control	22.000 EACH	_____.____	_____.____
0078	628.1910 Mobilizations Emergency Erosion Control	16.000 EACH	_____.____	_____.____
0080	628.7005 Inlet Protection Type A	3.000 EACH	_____.____	_____.____
0082	628.7020 Inlet Protection Type D	3.000 EACH	_____.____	_____.____
0084	628.7560 Tracking Pads	2.000 EACH	_____.____	_____.____
0086	629.0210 Fertilizer Type B	7.000 CWT	_____.____	_____.____
0088	630.0140 Seeding Mixture No. 40	150.000 LB	_____.____	_____.____
0090	630.0200 Seeding Temporary	220.000 LB	_____.____	_____.____
0092	630.0500 Seed Water	190.000 MGAL	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0094	631.0300 Sod Water	80.000 MGAL	_____.____	_____.____
0096	631.1000 Sod Lawn	3,450.000 SY	_____.____	_____.____
0104	632.9101 Landscape Planting Surveillance and Care Cycles	24.000 EACH	_____.____	_____.____
0106	633.5200 Markers Culvert End	1.000 EACH	_____.____	_____.____
0108	634.0612 Posts Wood 4x6-Inch X 12-FT	4.000 EACH	_____.____	_____.____
0110	634.0614 Posts Wood 4x6-Inch X 14-FT	14.000 EACH	_____.____	_____.____
0112	637.2210 Signs Type II Reflective H	73.250 SF	_____.____	_____.____
0114	639.0108 Drill Hole in Earth 8-Inch	100.000 LF	_____.____	_____.____
0116	639.0112 Drill Hole in Earth 12-Inch	170.000 LF	_____.____	_____.____
0118	639.1008 Well Casing Pipe 8-Inch	182.000 LF	_____.____	_____.____
0120	639.1700 Well Screen	20.000 LF	_____.____	_____.____
0122	639.2100 Grout for Sealing Well Casing	54.000 CF	_____.____	_____.____
0124	639.4000 Test Pumping	2.000 EACH	_____.____	_____.____
0126	642.5401 Field Office Type D	1.000 EACH	_____.____	_____.____
0128	643.0300 Traffic Control Drums	18,500.000 DAY	_____.____	_____.____
0130	643.0420 Traffic Control Barricades Type III	1,450.000 DAY	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0132	643.0705 Traffic Control Warning Lights Type A	2,850.000 DAY	_____.____	_____.____
0134	643.0900 Traffic Control Signs	3,540.000 DAY	_____.____	_____.____
0136	643.0910 Traffic Control Covering Signs Type I	2.000 EACH	_____.____	_____.____
0138	643.0920 Traffic Control Covering Signs Type II	2.000 EACH	_____.____	_____.____
0140	643.1050 Traffic Control Signs PCMS	7.000 DAY	_____.____	_____.____
0142	643.3170 Temporary Marking Line Epoxy 6-Inch	610.000 LF	_____.____	_____.____
0144	643.5000 Traffic Control	1.000 EACH	_____.____	_____.____
0146	645.0120 Geotextile Type HR	13.000 SY	_____.____	_____.____
0148	650.4000 Construction Staking Storm Sewer	3.000 EACH	_____.____	_____.____
0150	650.4500 Construction Staking Subgrade	1,110.000 LF	_____.____	_____.____
0152	650.5000 Construction Staking Base	300.000 LF	_____.____	_____.____
0154	650.5500 Construction Staking Curb Gutter and Curb & Gutter	160.000 LF	_____.____	_____.____
0156	650.7000 Construction Staking Concrete Pavement	820.000 LF	_____.____	_____.____
0158	650.8501 Construction Staking Electrical Installations (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0160	650.9000 Construction Staking Curb Ramps	4.000 EACH	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0162	650.9500 Construction Staking Sidewalk (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0164	650.9911 Construction Staking Supplemental Control (project) 01. 1071-07-79	1.000 EACH	_____.____	_____.____
0166	650.9920 Construction Staking Slope Stakes	1,110.000 LF	_____.____	_____.____
0168	652.0125 Conduit Rigid Metallic 2-Inch	30.000 LF	_____.____	_____.____
0170	652.0225 Conduit Rigid Nonmetallic Schedule 40 2-Inch	3,160.000 LF	_____.____	_____.____
0172	652.0235 Conduit Rigid Nonmetallic Schedule 40 3-Inch	215.000 LF	_____.____	_____.____
0174	653.0140 Pull Boxes Steel 24x42-Inch	6.000 EACH	_____.____	_____.____
0176	653.0164 Pull Boxes Non-Conductive 24x42-Inch	16.000 EACH	_____.____	_____.____
0178	654.0105 Concrete Bases Type 5	4.000 EACH	_____.____	_____.____
0180	654.0111 Concrete Bases Type 11	20.000 EACH	_____.____	_____.____
0182	654.0230 Concrete Control Cabinet Bases Type L30	1.000 EACH	_____.____	_____.____
0184	655.0610 Electrical Wire Lighting 12 AWG	1,440.000 LF	_____.____	_____.____
0186	655.0615 Electrical Wire Lighting 10 AWG	5,799.000 LF	_____.____	_____.____
0188	655.0625 Electrical Wire Lighting 6 AWG	450.000 LF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0192	656.0501 Electrical Service Breaker Disconnect Box (location) 01. CCTV410190	1.000 EACH	_____.____	_____.____
0194	659.0700 Lighting Units Walkway	20.000 EACH	_____.____	_____.____
0196	659.2130 Lighting Control Cabinets 120/240 30-Inch	1.000 EACH	_____.____	_____.____
0198	670.0101 Field System Integrator	1.000 EACH	_____.____	_____.____
0200	670.0201 ITS Documentation	1.000 EACH	_____.____	_____.____
0202	671.0112 Conduit HDPE 1-Duct 2-Inch	585.000 LF	_____.____	_____.____
0204	671.0122 Conduit HDPE 2-Duct 2-Inch	480.000 LF	_____.____	_____.____
0206	673.1225.S Install Pole Mounted Cabinet	1.000 EACH	_____.____	_____.____
0208	677.0150 Install Camera Pole 50-FT	1.000 EACH	_____.____	_____.____
0210	677.0200 Install Camera Assembly	1.000 EACH	_____.____	_____.____
0212	678.0600 Install Ethernet Switches	1.000 EACH	_____.____	_____.____
0214	690.0250 Sawing Concrete	140.000 LF	_____.____	_____.____
0216	715.0720 Incentive Compressive Strength Concrete Pavement	500.000 DOL	1.00000	500.00
0218	ASP.1T0A On-the-Job Training Apprentice at $5.00/HR	2,500.000 HRS	5.00000	12,500.00
0220	ASP.1T0G On-the-Job Training Graduate at $5.00/HR	3,520.000 HRS	5.00000	17,600.00

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0222	SPV.0060 Special 01. Bench	13.000 EACH	_____.____	_____.____
0224	SPV.0060 Special 02. Litter Receptacle	33.000 EACH	_____.____	_____.____
0226	SPV.0060 Special 03. Recycling Receptacle	33.000 EACH	_____.____	_____.____
0228	SPV.0060 Special 04. Picnic Table	12.000 EACH	_____.____	_____.____
0230	SPV.0060 Special 05. ADA Picnic Table	4.000 EACH	_____.____	_____.____
0232	SPV.0060 Special 06. Flag Pole	3.000 EACH	_____.____	_____.____
0234	SPV.0060 Special 07. Planting Container	4.000 EACH	_____.____	_____.____
0236	SPV.0060 Special 08. Picnic Shelter	4.000 EACH	_____.____	_____.____
0238	SPV.0060 Special 09. Install Cellular Modem	1.000 EACH	_____.____	_____.____
0240	SPV.0060 Special 10. Ground Rod	1.000 EACH	_____.____	_____.____
0242	SPV.0060 Special 11. Rest Area Building General	1.000 EACH	_____.____	_____.____
0244	SPV.0060 Special 12. Rest Area Building Plumbing	1.000 EACH	_____.____	_____.____
0246	SPV.0060 Special 13. Rest Area Building HVAC	1.000 EACH	_____.____	_____.____
0248	SPV.0060 Special 14. Rest Area Building Electrical	1.000 EACH	_____.____	_____.____
0250	SPV.0060 Special 15. Maintenance Building General	1.000 EACH	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0252	SPV.0060 Special 16. Maintenance Building Plumbing	1.000 EACH	_____.____	_____.____
0254	SPV.0060 Special 17. Maintenance Building HVAC	1.000 EACH	_____.____	_____.____
0256	SPV.0060 Special 18. Maintenance Building Electrical	1.000 EACH	_____.____	_____.____
0258	SPV.0060 Special 19. Electrical Service, Sparta Rest Area	1.000 EACH	_____.____	_____.____
0260	SPV.0060 Special 20. Sewage Ejector Pump and Controls	1.000 EACH	_____.____	_____.____
0262	SPV.0060 Special 21. Pitless Adapter	2.000 EACH	_____.____	_____.____
0264	SPV.0060 Special 22. Well Pump	2.000 EACH	_____.____	_____.____
0266	SPV.0060 Special 23. Sanitary Sewer Manhole 4-ft	3.000 EACH	_____.____	_____.____
0268	SPV.0060 Special 24. Coring Manhole	1.000 EACH	_____.____	_____.____
0270	SPV.0060 Special 25. Well System Controls	1.000 EACH	_____.____	_____.____
0272	SPV.0060 Special 26. Adjusting Manhole Covers with Rubber Rings	1.000 EACH	_____.____	_____.____
0274	SPV.0060 Special 27. Bollard	7.000 EACH	_____.____	_____.____
0276	SPV.0090 Special 01. Split Rail Fence	260.000 LF	_____.____	_____.____
0278	SPV.0090 Special 02. Pipe Underdrain (8-Inch) with Geotextile Fabric and Aggregate	440.000 LF	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0280	SPV.0090 Special 03. Forcemain PVC, 2-Inch	334.000 LF	_____.____	_____.____
0282	SPV.0090 Special 04. Sanitary Sewer PVC 4-Inch	42.000 LF	_____.____	_____.____
0284	SPV.0090 Special 05. Sanitary Sewer PVC 8-Inch	539.000 LF	_____.____	_____.____
0286	SPV.0090 Special 06. Underground Copper Water Line 1-Inch	390.000 LF	_____.____	_____.____
0288	SPV.0090 Special 07. Underground Copper Water Line 3-Inch	595.000 LF	_____.____	_____.____
0290	SPV.0090 Special 08. Construction Staking Sanitary Sewer System	915.000 LF	_____.____	_____.____
0292	SPV.0165 Special 01. Unit Paving	773.000 SF	_____.____	_____.____
0294	632.0101 Trees (species, root, size) 01. Celtis Occidentalis 'Chicagoland' Chicagoland Hackberry, 2.5” Cal, B&B	9.000 EACH	_____.____	_____.____
0296	632.0101 Trees (species, root, size) 02. Gleditsia Triacanthos Inermis 'Skycole' Skyline Honey Locust, 2.5” Cal, B&B	6.000 EACH	_____.____	_____.____
0298	632.0101 Trees (species, root, size) 03. Quercus Alba White Oak, 2.5” Cal, B&B	6.000 EACH	_____.____	_____.____
0300	632.0101 Trees (species, root, size) 04. Quercus Bicolor Swamp White Oak, 2.5” Cal, B&B	4.000 EACH	_____.____	_____.____
0302	632.0201 Shrubs (species, root, size) 01. Aronia Melanocarpa Var. Elataglossy Black Chokeberry, 12” Height, Cont.	12.000 EACH	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0304	632.0201 Shrubs (species, root, size) 02. Ceanothus Americanus New Jersey Tea, 12” Height, Cont.	18.000 EACH	_____.____	_____.____
0306	632.0201 Shrubs (species, root, size) 03. Dasiphora Fruticosa Bush Cinquefoil, 12” Height, Cont.	3.000 EACH	_____.____	_____.____
0308	632.0201 Shrubs (species, root, size) 04. Diervilla Lonicera Dwarf Bush Honeysuckle, 12” Height, Cont.	9.000 EACH	_____.____	_____.____
0310	632.0201 Shrubs (species, root, size) 05. Ribes Americanum American Black Currant, 12” Height, Cont.	14.000 EACH	_____.____	_____.____
0312	632.0201 Shrubs (species, root, size) 06. Symphoricarpos Albus Common Snowberry, 12” Height, Cont.	24.000 EACH	_____.____	_____.____
0314	632.0201 Shrubs (species, root, size) 07. Anaphalis Margaritacea Pearly Everlasting, DP 50, Plug	28.000 EACH	_____.____	_____.____
0316	632.0201 Shrubs (species, root, size) 08. Asclepias Tuberosa Butterfly Milkweed, DP 50, Plug	74.000 EACH	_____.____	_____.____
0318	632.0201 Shrubs (species, root, size) 09. Asclepias Verticillata Whorled Milkweed, DP 50, Plug	72.000 EACH	_____.____	_____.____
0320	632.0201 Shrubs (species, root, size) 10. Bouteloua Curtipendula Side Oats Grama, DP 50, Plug	48.000 EACH	_____.____	_____.____
0322	632.0201 Shrubs (species, root, size) 11. Bouteloua Gracilis Blue Grama Grass, DP 50, Plug	31.000 EACH	_____.____	_____.____

Proposal ID: 20240514002 **Project(s):** 1071-07-79

Federal ID(s): WISC 2024351

SECTION: 0001 Contract Items

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0324	632.0201 Shrubs (species, root, size) 12. Dalea Purpurea Purple Prairie Clover, DP 50, Plug	48.000 EACH	_____.____	_____.____
0326	632.0201 Shrubs (species, root, size) 13. Echinacea Angustifolia Narrow Leaf Coneflower, DP 50, Plug	50.000 EACH	_____.____	_____.____
0328	632.0201 Shrubs (species, root, size) 14. Fragaria Vesca Woodland Strawberry, DP 50, Plug	86.000 EACH	_____.____	_____.____
0330	632.0201 Shrubs (species, root, size) 15. Heuchera Richardsonii Prairie Alum Root, DP 50, Plug	92.000 EACH	_____.____	_____.____
0332	632.0201 Shrubs (species, root, size) 16. Monarda Fistulosa Bergamot, DP 50, Plug	41.000 EACH	_____.____	_____.____
0334	632.0201 Shrubs (species, root, size) 17. Schizachyrium Scoparium Little Bluestem, DP 50, Plug	31.000 EACH	_____.____	_____.____
0336	632.0201 Shrubs (species, root, size) 18. Sporobolus Heterolepis Prairie Dropseed, DP 50, Plug	39.000 EACH	_____.____	_____.____
0338	632.0201 Shrubs (species, root, size) 19. Symphyotrichum Sericeum Silky Aster, DP 50, Plug	38.000 EACH	_____.____	_____.____

Section: 0001 **Total:** _____.____

Total Bid: _____.____

Wisconsin Department of Transportation

Division of Transportation Systems Development
Bureau of Project Development
4822 Madison Yards Way, 4th Floor South
Madison, WI 53705

Telephone: (608) 266-1631
Facsimile (FAX): (608) 266-8459

May 9, 2024

NOTICE TO ALL CONTRACTORS:

Proposal #02: 1071-07-79, WISC2024351
La Crosse – Sparta
(Safety Rest Area 16 Sparta Building)
IH 90
Monroe County

Letting of May 14, 2024

This is Addendum No. 02, which provides for the following:

Special Provisions:

Revised Special Provisions	
Article No.	Description
28	Site Furnishings
40	Rest Area Building General, Item SPV.0060.11; Maintenance Building General, Item SPV.0060.15
42	Rest Area Building HVAC, Item SPV.0060.13; Maintenance Building HVAC, Item SPV.0060.17
43	Rest Area Building Electrical, Item SPV.0060.14; Maintenance Building Electrical, Item SPV.0060.18

Plan Sheets:

Revised Plan Sheets	
Plan Sheet	Plan Sheet Title (brief description of changes to sheet)
77	Revised Building Architectural Plan (A1-50) – Updated manual roller shade profile information
78	Revised Building Architectural Plan (A1-51) – Clarified mounting and revised comments in furniture schedule
208	Revised Building Architectural Plan (E5-14) – Add circuit for data rack receptacle to panel schedule
213	Revised Building Architectural Plan (T2-00) – Updated technology plans & keynote legend
215	Revised Building Architectural Plan (T4-12) – Updated main building cabinet elevation & added maintenance shed cabinet elevation
216	Revised Building Architectural Plan (T5-11) – Updated riser diagrams
217	Revised Building Architectural Plan (T6-11) – Updated schedules

254	Revised Building Architectural Plan (G-E2-13) – Add quad receptacle at data rack location
255	Revised Building Architectural Plan (G-T2-13) – Updated technology plans & keynote legend

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractor.

Sincerely,

Mike Coleman

Proposal Development Specialist
Proposal Management Section

ADDENDUM NO. 02

1071-07-79

May 9, 2024

Special Provisions

28. Site Furnishings.

Replace section 2.2 (f) (2) under subsection titled **Part 2 Products** *under section titled* **Section 32 33 00 –**

Site Furnishings *with the following:*

2. Model: Concrete Trash Receptacle with Domed Plastic Top, Model No. TF1150 and 39 Gal. Plastic Liner, Model No. TF1635

40. Rest Area Building General, Item SPV.0060.11; Maintenance Building General, Item SPV.0060.15.

Add Section **07 42 13.23 - Metal Composite Material Wall Panels**

Section 07 42 13.23 - Metal Composite Material Wall Panels

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.

B. Matching flashing and trim.

1.2 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Water-resistive barrier behind wall panel system.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.

E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2022a.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

H. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2022.

I. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

L. ASTM D523 - Standard Test Method for Specular Gloss; 2014 (Reapproved 2018).

M. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2021).

N. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.

O. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2023.

P. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet; 2010 (Reapproved 2022).

Q. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2023.

R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023b.

S. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.

1. Require attendance by the installer and relevant sub-contractors.

2. Include MCM sheet manufacturer’s representative and wall system manufacturer’s representative to review storage and handling procedures.

3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.

4. Review procedures for protection of work and other construction.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:

1. Finish manufacturer's data sheet showing physical and performance characteristics.

2. Storage and handling requirements and recommendations.

3. Fabrication instructions and recommendations.

4. Specimen warranty for finish, as specified herein.

C. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:

1. Physical characteristics of components shown on shop drawings.

2. Storage and handling requirements and recommendations.

3. Installation instructions and recommendations.

4. Specimen warranty for wall system, as specified herein.

D. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips, exposed fasteners, number of anchors, supports, reinforcement, trim, flashings, and accessories.

1. Indicate panel numbering system.

2. Differentiate between shop and field fabrication.

3. Indicate substrates and adjacent work with which the wall system must be coordinated.

4. Include large-scale details of anchorages and connecting elements.

5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.

6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

E. Verification Samples: For each finish product specified, submit at least three samples, minimum size 12 inch square, and representing actual product in color and texture.

F. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.

G. Maintenance Data: Care of finishes and warranty requirements.

H. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Protect finishes by applying heavy-duty removable plastic film during production.

2. Package for protection against transportation damage.

3. Provide markings to identify components consistently with drawings.

4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Store in well-ventilated space out of direct sunlight.

2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.

3. Store at a slope to ensure positive drainage of accumulated water.

4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.

5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

1.7 WARRANTY

A. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:

1. Chalking: No more than that represented by a No. 8 rating based on ASTM D4214.
2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Alucobond Rainscreen Composite Wall Panel System.

B. Metal Composite Material (MCM) Sheet Manufacturers:

1. ALUCOBOND by 3A Composites USA; ALUCOBOND PLUS: www.alucobondusa.com/#sle.
2. Alfrex, LLC; Alfrex fr: www.alfrexusa.com/#sle.
3. ALPOLIC Materials; ALPOLIC/fr (Fire Retardant core): www.alpolic-americas.com/#sle.
4. Alucoil North America LLC; larson by Alucoil, FR Core (fire resistant): www.alucoilnorthamerica.com/#sle.
5. Arconic Architectural Products, Inc; Reynobond: www.arconic.com.com/#sle.
6. Citadel Architectural Products, Inc; Envelope 2000: www.citadelap.com/#sle.
7. Fairview Architectural LLC; VitraBond (Fire Rated): www.fairview-na.com/#sle.
8. Metal Construction Association: www.metalconstruction.org.
9. Substitutions: See Section 01 60 00 - Product Requirements.

C. Wall Panel System Manufacturers:

1. Listed Material Sheet Manufacturers.
2. Americlad: www.americlad.com.
3. Kanalco Ltd: www.kanalco.com/#sle.
4. Laminators Inc: www.laminators.com.
5. Metal Construction Association: www.metalconstruction.org.
6. Metal Design Systems, Inc: www.metaldesignsystems.com.
7. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
8. Progressive Building Systems: www.pbsmetals.com.
9. Protean: www.protean.com.
10. SGH Concepts: sghconcepts.com.
11. Specialty Systems, Inc: www.specialtysystemsinc.com.
12. TFC Canopy: www.tfccanopy.com.
13. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 WALL PANEL SYSTEM

A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.

1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.

2. Provide panel jointing using a reveal joint without gaskets or sealant.

3. Anchor panels to supporting framing without exposed fasteners.

B. Performance Requirements

1. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.

C. Panels: 1 inch deep pans formed of metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.

1. Reinforce corners with riveted aluminum angles.

2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel; attachment members may also function as stiffeners.

3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length; provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.

4. Secure members to back face of panels using structural silicone sealant approved by MCM sheet manufacturer.

5. Fabricate panels under controlled shop conditions.

6. Where final dimensions cannot be established by field measurement before commencement of manufacturing, make allowance for field adjustments without requiring field fabrication of panels.

7. Fabricate as indicated on drawings and as recommended by MCM sheet manufacturer.

a. Make panel lines, breaks, curves, and angles sharp and true.

b. Keep plane surfaces free from warp or buckle.

c. Keep panel surfaces free of scratches or marks caused during fabrication.

8. Provide joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on inside face of panel system.

2.3 MATERIALS

A. Metal Composite Material (MCM) Sheet: Two sheets of aluminum sandwiching a core of extruded thermoplastic material; no foamed insulation material content.

1. Alternate Metal Composite Material (MCM) Sheet: Citadel Architectural Products, Inc; Envelope 2000 is considered equivalent to other MCM product materials specified.

2. Overall Sheet Thickness: 4 mm, minimum.

3. Face Sheet Thickness: 0.019 inch, minimum.

4. Bond and Peel Strength: No adhesive failure of the bond between the core and the skin nor cohesive failure of the core itself below 22.4 inch-pound/inch with no

degradation in bond performance, when tested in accordance with ASTM D1781, simulating resistance to panel delamination, after 8 hours of submersion in boiling water and after 21 days of immersion in water at 70 degrees F.

5. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450 maximum; when tested in accordance with ASTM E84.

6. Flammability: Self-ignition temperature of 650 degrees F or greater when tested in accordance with ASTM D1929.

7. Factory Finish: One coat fluoropolymer resin coating, approved by the coating manufacturer for the length of warranty specified for the project, and applied by coil manufacturing facility that specializes in coil applied finishes.

   a. Coating Flexibility: Pass ASTM D4145 minimum 1T-bend, at time of manufacturing.

   b. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.

8. Colors: As scheduled on the drawings.

B. Metal Framing Members: Include sub-girts, zee-clips, base and sill angles and channels, hat-shaped and rigid channels, and furring channels required for complete installation.

1. Provide material strength, dimensions, configuration as required to meet applied loads and in compliance with applicable building code.

2. Sheet Steel Components: ASTM A653/A653M galvanized to G90/Z275 or zinc-iron alloy-coated to A60/ZF180; or ASTM A792/A792M aluminum-zinc coated to AZ60/AZM180.

3. Stainless Steel Sheet Components: ASTM A480/A480M.

4. Aluminum Components: ASTM B209/B209M; or ASTM B221 (ASTM B221M).

5. Panel Support Framing: See Section 05 40 00.

2.4 FINISHES

A. Factory Finish: Two coat fluoropolymer resin coating, approved by coating manufacturer for length of warranty specified for project, and applied by coil manufacturing facility that specializes in coil applied finishes.

1. Coating Flexibility: Pass ASTM D4145 minimum 1T Bend at time of manufacturing.

2. Long-Term Performance: Not less than that specified under WARRANTY in PART 1.

2.5 ACCESSORIES

A. Flashing: Sheet aluminum; 0.040 inch thick, minimum; finish and color to match MCM sheet; see Section 07 62 00 for additional requirements.

B. Support for Cladding and Continuous Insulation: Thermal clips.

1. Thermally-broken clips that provide attachment support for girts, angles, channels, and other cladding support framing.

2. Galvanized Steel Support Clip: 14 gauge, 0.0747 inch, G90/Z275 galvanized support clip complying with ASTM A653/A653M, with integral glass fiber reinforced polyamide thermal isolator pad.

3. Fasteners: As recommended by clip manufacturer.

C. Anchors, Clips, and Accessories: Use one of the following:

1. Stainless steel complying with ASTM A276/A276M, ASTM A480/A480M, or ASTM A666.
2. Steel complying with ASTM A36/A36M and hot-dip zinc coating to ASTM A153/A153M.
3. Steel complying with ASTM A36/A36M and hot-dip galvanized to ASTM A123/A123M, with Coating Thickness Grade of 100.

D. Fasteners:

1. Exposed Fasteners: Stainless steel; permitted only where absolutely unavoidable and subject to prior approval of the Architect.
2. Screws: Self-drilling or self-tapping Type 410 stainless steel or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
3. Bolts: Stainless steel.
4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

E. Provide panel system manufacturer's and installer's standard corrosion resistant accessories, including fasteners, clips, anchorage devices, and attachments.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine dimensions, tolerances, and interfaces with other work.

1. Verify that weather barrier system is properly installed; see Section 07 25 00 for requirements.

B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work areas and finish surfaces from damage during installation.

3.3 INSTALLATION

A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.

B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.

C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.

E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.

F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.

G. Install flashings as indicated on shop drawings. At flashing butt joints, provide a lap strap under flashing and seal lapped surfaces with a full bed of non-hardening sealant.

H. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:

1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.

2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.

3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.

4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

I. Replace damaged products.

1. Exception: Field repairs of minor damage to finishes are permitted only when approved in writing by Architect, panel manufacturer, and fabricator.

2. Field Repairs to Finishes: Using materials and methods sufficient that repairs are not discernible when viewed at distance of 10 feet under all typical light conditions experienced at the project.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.

C. Site Visits: Schedule two site visits during execution of installation.

3.5 CLEANING

A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.

B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.

C. Remove temporary coverings and protection of adjacent work areas.

D. Clean installed products in accordance with manufacturer's instructions.

3.6 PROTECTION

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 commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.

b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the 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 Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop

Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to Arrow. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded Arrow.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. 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.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

    a. McKinney (MK) - TA/T4A Series, 5 knuckle.
    b. Hager
    c. Stanley

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

    a. Pemko (PE).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

    a. Rockwood (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

6. Manufacturers:

    a. Rockwood (RO).
    b. Hiawatha
    c. Quality
    d. Ives
    e. Burns

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

    a. BEST Interchangeable Core, SFIC (Small Format), 6-7 Pin, or equivalent.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

6. Keyway: “Best” To be determined as directed by Owner.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.

2. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 12.3 million cycles or greater.

3. Manufacturers:

a. Arrow, formerly known as Yale (YA) - 8800FL Series.
b. Corbin Russwin
c. Sargent

d. Schlage

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.

2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Tubular Panic Devices: ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Device to be ADA compliant requiring less than 5 lbs. of force to activate. Post mounting with optional mechanical dogging. Provide proper fasteners as required by manufacturer to meet application requirements. Provide exit devices on both leaves of pairs of doors.

1. Style: Exposed vertical rod. 1-1/4” grip diameter with interior operating panic handle in combination with exterior fixed pull handle. Panic mechanism shall be concealed within brass or stainless steel tubing. Optional entrance from exterior by a keyed cylinder.
2. Configurations (provide as specified):

    a. Half Height L-Shape Pull.

3. Push/pull operation when dogged from the inside.
4. Latching: Top latching. Reversed, flat, Pullman style. Roller-type latching not acceptable.
5. Engraved "PUSH" signage with optional paint infill and boundary grooves.

6. Manufacturers:

    a. Rockwood (RO) - PDU8500 Series.
    b. Corbin Russwin
    c. Von Duprin
    d. Sargent
    e. Precision
    f. Monarch

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where

closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

    a. Arrow, formerly known as Yale (YA) - 4400 Series.
    b. Corbin Russwin
    c. LCN
    d. Norton
    e. Sargent

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

    a. Arrow, formerly known as Yale (YA) - Unitrol Series.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Rockwood (RO).
    b. Hiawatha
    c. Quality
    d. Ives
    e. Burns

2.11 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

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. Manufacturers:

1. Pemko (PE).
2. Zero
3. Reese
4. National Guard

2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, 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. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

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.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. YA - Arrow, formerly known as Yale
6. OT - Other

Hardware Sets

Set: 1.0

Doors: 101A, 103A

2	Continuous Hinge	CFM_SLF-HD1 x Length Required		PE	087100
2	Storefront Panic Device	PDU8500-1 01 (Keyed as Required)	US32D	RO	087100
2	Drop Plate	486	689	YA	087100
2	Blade Stop	891	689	YA	087100
2	Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA	087100

1	Threshold	273x224AFGT x MSES25SS x Length Required		PE	087100
1	Gasketing	Provided By Door/Frame Supplier		OT	
2	Sweep	3452CNB x Length Required		PE	087100

Notes: Perimeter Weatherstrip by the Aluminum Door Manufacturer.

Set: 2.0

Doors: 111A

6	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK	087100
1	Self Latching Flush Bolt Set	2845 / 2945 (as required)	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
2	Surface Closer	UNI4410 (HD PA SPG STP Arm w/HO - EXT)	689	YA	087100
2	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Threshold	175A MSES25SS x Length Required		PE	087100
1	Gasketing	303AS (Head & Jambs)		PE	087100
1	Rain Guard	346C x Width of Frame Head		PE	087100
2	Sweep	3452CNB x Length Required		PE	087100
2	Astragal	29324CNB x Door Height		PE	087100

Set: 2.1

Doors: 110A

3	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK	087100
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1	Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA	087100
1	Electric Strike	1600-CS	630	HS	087100
1	ElectroLynx Adaptor	2004M		HS	087100
1	SMART Pac Bridge Rectifier	2005M3		HS	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Threshold	175A MSES25SS x Length Required		PE	087100
1	Gasketing	303AS (Head & Jambs)		PE	087100
1	Rain Guard	346C x Width of Frame Head		PE	087100
1	Sweep	3452CNB x Length Required		PE	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Frame)	QC-C3000P		MK	087100
1	Position Switch	DPS-MW-BK/GY/WH (as required)		SU	087100

1	Motion Sensor	XMS		SU	087100
1	Power Supply	AQD (Size and Options as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: This opening is scheduled and is to be wired for future access control operation. Coordinate all Wiring and conduit with electrical contractor.

Intended Future Operation Description:
• The door is normally closed and secure.
• When a proper credential is presented to the Card Reader (by Others) the power supply will momentarily release the electric strike to allow entry.
• Egress from the unsecured side is always available by turning the lever on the lockset. Request to Exit Sensor on the unsecure side of the opening will signal and authorized egress to access control.
• Door Position Switch will monitor the doors OPEN/CLOSED status.
• Key on secured side will retract latch to allow entry.
• Electric Strike is Fail Secure and will remain locked in the event of a fire emergency or power outage.

Set: 3.0

NOT USED

~~3~~	~~Hinge, Full Mortise, Hvy Wt~~	~~T4A3386 (NRP and size as required)~~	~~US32D~~	~~MK~~	~~087100~~
~~1~~	~~Storeroom or Closet Lock~~	~~TBR 8805RL (Keyed as Required)~~	~~630~~	~~YA~~	~~087100~~
~~1~~	~~Surface Closer~~	~~UNI4400 (HD PA SPG STP Arm - EXT)~~	~~689~~	~~YA~~	~~087100~~
~~1~~	~~Kick Plate~~	~~K1050 10" high CSK BEV~~	~~US32D~~	~~RO~~	~~087100~~
~~1~~	~~Threshold~~	~~175A MSES25SS x Length Required~~		~~PE~~	~~087100~~
~~1~~	~~Gasketing~~	~~303AS (Head & Jambs)~~		~~PE~~	~~087100~~
~~1~~	~~Rain Guard~~	~~346C x Width of Frame Head~~		~~PE~~	~~087100~~
~~1~~	~~Sweep~~	~~3452CNB x Length Required~~		~~PE~~	~~087100~~

Set: 4.0

Doors: 101B, 103B

2	Continuous Hinge	CFM_SLF-HD1 x Length Required		PE	087100
2	Door Pull	RM3301 (Full Door Height - HD Back-to-Back Mounting)	US32D	RO	087100
2	Drop Plate	486	689	YA	087100
2	Blade Stop	891	689	YA	087100
2	Surface Closer	4420 (HD PA SPG STP Arm)	689	YA	087100
1	Gasketing	Provided By Door/Frame Supplier		OT	

Notes: Perimeter Weatherstrip and astragals by the Aluminum Door Manufacturer.

Set: 5.0

Doors: 001, 111B

3	Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100

Set: 5.1

Doors: 110B

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and size as required)	US26D	MK	087100
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Electric Strike	1600-CS	630	HS	087100
1	ElectroLynx Adaptor	2004M		HS	087100
1	SMART Pac Bridge Rectifier	2005M3		HS	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
3	Silencer	608		RO	087100
1	Card Reader	By Security Supplier			
1	ElectroLynx Harness (Frame)	QC-C3000P		MK	087100
1	Position Switch	DPS-MW-BK/GY/WH (as required)		SU	087100
1	Motion Sensor	XMS		SU	087100
1	Power Supply	AQD (Size and Options as required)		SU	087100
1	Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: This opening is scheduled and is to be wired for future access control operation. Coordinate all Wiring and conduit with electrical contractor.

Intended Future Operation Description:
• The door is normally closed and secure.
• When a proper credential is presented to the Card Reader (by Others) the power supply will momentarily release the electric strike to allow entry.
• Egress from the unsecured side is always available by turning the lever on the lockset. Request to Exit Sensor on the unsecure side of the opening will signal and authorized egress to access control.

• Door Position Switch will monitor the doors OPEN/CLOSED status.
• Key on secured side will retract latch to allow entry.
• Electric Strike is Fail Secure and will remain locked in the event of a fire emergency or power outage.

Set: 6.0

NOT USED

~~3~~	~~Hinge, Full Mortise~~	~~TA2714 (NRP and size as required)~~	~~US26D~~	~~MK~~	~~087100~~
~~1~~	~~Storeroom or Closet Lock~~	~~TBR 8805RL (Keyed as Required)~~	~~630~~	~~YA~~	~~087100~~
~~1~~	~~Surface Closer~~	~~4420 (HD PA SPG STP Arm)~~	~~689~~	~~YA~~	~~087100~~
~~1~~	~~Kick Plate~~	~~K1050 10" high CSK BEV~~	~~US32D~~	~~RO~~	~~087100~~
~~3~~	~~Silencer~~	~~608~~		~~RO~~	~~087100~~

Set: 6.1

Doors: 115

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and size as required)	US26D	MK	087100
1	Rim Exit Device, Nightlatch	7150 TB627F (Keyed as Required)	630	YA	087100
1	Surface Closer	4420 (HD PA SPG STP Arm)	689	YA	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 7.0

Doors: 113B, 114

3	Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1	Office Lock	TBR 8807RL (Keyed as Required)	630	YA	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100

Set: 8.0

Doors: 104, 105, 112

3	Hinge, Full Mortise	TA2714 (NRP and size as required)	US26D	MK	087100
1	Privacy Lock (w/OCC IND)	TBR 8802RL V21	630	YA	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100

3	Silencer	608		RO	087100
1	Coat Hook	RM801	US26D	RO	087100

Set: 9.0

Doors: 106A, 107A, 108A, 109A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (NRP and size as required)	US26D	MK	087100
1	Mortise Deadlock (Double Key/Classroom)	356 (Key as Required)	630	YA	087100
1	Push Plate	70C-RKW	US32D	RO	087100
1	Pull	RM3020-12 Mtg-Type 12XHD	US32-316	RO	087100
1	Surface Closer (Tri-Pack)	4400 (RA or PA Mount as Required)	689	YA	087100
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1	Wall Stop	403 (or) 441CU (As Required)	US26D	RO	087100
1	Silencer	608		RO	087100

Notes: Door can be locked into alternate jamb when opened 90 degrees. (Two Deadbolt Strikes are required)

END OF SECTION

Remove and replace **Section 08 71 00.20 - Door Hardware – (Maintenance Building)** *with the following:*

Section 08 71 00.20 - Door Hardware – (Maintenance Building)

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 commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.

g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the 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 Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to Arrow. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded Arrow.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. 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.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

    a. McKinney (MK) - TA/T4A Series, 5 knuckle.
    b. Hager
    c. Stanley

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

    a. Pemko (PE).

2.3 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

    a. BEST Interchangeable Core, SFIC (Small Format), 6-7 Pin, or equivalent

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: “Best” To be determined as directed by Owner.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.

2. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 12.3 million cycles or greater.

3. Manufacturers:

   a. Arrow, formerly known as Yale (YA) - 8800FL Series.
   b. Corbin Russwin
   c. Sargent
   d. Schlage

2.5 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.6 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Arrow, formerly known as Yale (YA) - 4400 Series.
b. Corbin Russwin

c. LCN
d. Norton
e. Sargent

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

a. Arrow, formerly known as Yale (YA) - Unitrol Series.

2.7 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

a. Rockwood (RO).
b. Hiawatha
c. Quality
d. Ives
e. Burns

2.8 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

2.9 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

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. Manufacturers:

1. Pemko (PE).
2. Zero
3. Reese
4. National Guard

2.10 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.11 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, 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. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

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.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. YA - Arrow, formerly known as Yale
6. OT - Other

Hardware Sets

Set: 1.0

Doors: 101B, 101C

3	Hinge, Full Mortise, Hvy Wt	T4A3386 (NRP and size as required)	US32D	MK
1	Storeroom or Closet Lock	TBR 8805RL (Keyed as Required)	630	YA
1	Surface Closer	UNI4400 (HD PA SPG STP Arm - EXT)	689	YA
1	Kick Plate	K1050 10" high CSK BEV	US32D	RO
1	Gasketing	303AS (Head & Jambs)		PE
1	Rain Guard	346C x Width of Frame Head		PE
1	Sweep	3452CNB x Length Required		PE
1	Threshold	175A MSES25SS x Length Required		PE

Set: 2.0

Doors: 101A

1	Hardware by Door/Frame Supplier	Hardware by Door/Frame Manufacturer		OT

END OF SECTION

42. Rest Area Building HVAC, Item SPV.0060.13; Maintenance Building HVAC, Item SPV.0060.17.

Add the following to section titled **1.12 Approved Manufacturers: The Following Are The Approved**

Control System Manufacturers *under subsection titled* **Part 1 General** *under section titled* **Section 23 09 24 – Direct Digital Control for HVAC**:

B. Delta Controls.

C. Honeywell International, Inc.

D. Johnson Controls, Inc.

E. Schneider Electric.

F. Siemens AG, Building Technologies Division.

43. Rest Area Building Electrical, Item SPV.0060.14; Maintenance Building Electrical, Item SPV.0060.18.

Add the following to section titled **2.1 Manufactures** *(b) under subsection titled* **Part 2 Products** *under section titled* **Section 26 32 13 – Engine Generators**:

5. Generac Power Systems: www.generac.com/

Plan Sheets
The following 8½ x 11-inch sheets are attached and made part of the plans for this proposal:
Revised: 77-78, 208, 213, 215-217, and 254-255.

END OF ADDENDUM

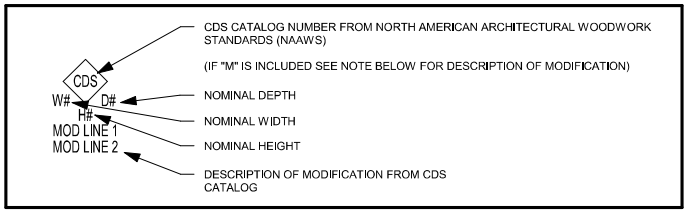
MISCELLANEOUS SCHEDULE

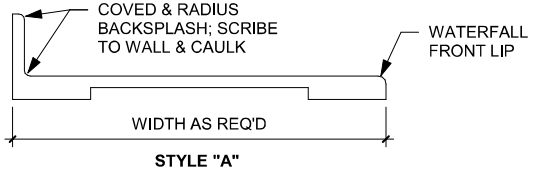
MARK	MATERIAL TYPE	MANUFACTURER	PROFILE	COLOR	ADDITIONAL INFORMATION	COMMENTS
DIS-1	DISPLAY CASE	REFER TO SPECS	9' W x 4'H x 8"D		2" METAL FRAME / SWING GLASS DOORS W/ HINGES AND 2 LOCKS ON DOOR (TOP AND BOTTOM)	--
DLS-1	DIMENSIONAL LETTER SIGNAGE	GEMINI	FLAT CUT METAL / 8"H X 1/4"TH	STAINLESS	1" STANDOFFS	FINAL VERBIAGE TO BE APPROVED BY CLIENT PRIOR TO MANUF.
HDW-1	METAL COUNTER BRACKET	A&M HARDWARE	24 X 24	BLACK	TO BE INSTALLED AT EVERY 60" O.C OR CONTRACTOR RECOMMENDATION	--
HDW-2	METAL COUNTER BRACKET	A&M HARDWARE	16 X 16	BLACK	TO BE INSTALLED AT EVERY 60" O.C OR CONTRACTOR RECOMMENDATION	--
LOCKERS	LOCKERS	PENCO	VANGUARD DOUBLE TIER LOCKERS / 6'H x 1'-3"W x 1'-6"D	JET BLACK	SLOPE TOPS	--
TOILET PARTITIONS	SOLID PLASTIC HDPE	SCRANTON - HINY HIDERS	-	CHARCOAL GREY	5'H URINAL PARITION	DOOR FRONTS ONLY - SIDE OF STALLS ARE TILED WALLS
TS-1	METAL TRIM	SCHLUTER SYSTEMS	RONDEC	SATIN ANODIZED	INSTALL AT ALL EXTERIOR TILE CORNERS AND EXPOSED TILE LOCATIONS	--
TS-2	FLOOR TRANSITION	TARKETT	SLIM LINE TRANSITIONS - SLT	BLACK	INSTALL AT ALL CPT / SC LOCATIONS	--
WG-1	WALL GUARD	SOLAN	15"S W X 3"X75"H	STAINLESS	ADHERE ON TOP OF TILE	--
WT-1	MANUAL ROLLER SHADE SHADE	LUTRON	CONTRACT ROLLER	E SCREEN / CHARCOAL	3% OPEN / INSIDE MOUNT / BLACK FASCIA	OFFICE WINDOWS

Addendum No. 02
ID 1071-07-79
Revised Sheet 77
May 9, 2024

PROJECT FINISH NOTES

A.	SOME SPECIFIED PRODUCTS AND FINISHES MAY HAVE SUBSTANTIAL LEAD TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PLACING ORDERS IN A MANNER TO ENSURE THEIR TIMELY ARRIVAL. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EXPENSES, INCLUDING DESIGN FEES, RELATED TO ANY RESELECTION REQUIRED DUE TO FAILURE TO ORDER PRODUCTS IN A TIMELY MANNER.
B.	ALL FINISH WORK SHALL BE PERFORMED IN COMPLIANCE WITH DRAWINGS AND SPECIFICATIONS. SHOP DRAWINGS, SAMPLES, AND PRODUCT DATA SHALL BE SUBMITTED TO THE ARCHITECT FOR THEIR REVIEW & APPROVAL PRIOR TO BEGINNING WORK.
C.	ALL WALLS TO RECEIVE PNT-1 & B-1, UNLESS NOTED OTHERWISE.
D.	BULKHEADS AND SOFFITS: ALL SIDES AND UNDERSIDES TO BE PAINTED THE PAINT COLOR INDICATED, UNLESS NOTED OTHERWISE.
E.	REFER TO REFLECTED CEILING PLANS FOR CEILING/SOFFIT FINISHES AND LOCATIONS.
F.	PAINT ALL EXPOSED DUCTWORK, CONDUIT, ELECTRICAL EQUIPMENT, ETC, TO MATCH ADJACENT SURFACES, UNLESS NOTED OTHERWISE.
G.	EXTEND ALL FLOORING UNDER FURNITURE, DESKS AND COUNTERS, UNLESS NOTED OTHERWISE.
H.	ALL FLOORING TRANSITIONS TO BE CENTERED UNDER DOOR IN CLOSED POSITION, UNLESS NOTED OTHERWISE.
I.	INSTALL FLOORING PER PATTERNS REFLECTED ON FINISH PLANS. REFER TO FINISH SCHEDULE FOR ADDITIONAL NOTES.
J.	INSTALL DIFFERENT FLOORING TYPES PER MANUFACTURER'S RECOMMENDED METHODS, UNLESS NOTED OTHERWISE.
K.	FLOOR TILE AT FLOOR DRAINS TO BE INSTALLED WITH MINIMAL CUTS.
L.	INSTALL FIRE TREATED BLOCKING AS REQUIRED IN ALL PARTITIONS TO RECEIVE COUNTERS, SHELVING, MARKER BOARDS, TV'S, ETC.
M.	ALL EXPOSED ENDS OF CASEWORK TO HAVE FINISHED END PANELS.
N.	VERIFY GROMMET LOCATIONS WITH DESIGNER.
O.	IN-WALL OR WALL SUPPORT BRACKETS TO BE PAINTED TO MATCH WALL FINISH, UNLESS NOTED OTHERWISE.
P.	PLUMBING FIXTURES HAVE BEEN REMOVED FROM FINISH PLAN FOR VIEWING CLARITY. REFER TO THE RESPECTIVE PLANS AND DOCUMENTS FOR PLUMBING CRITERIA.
Q.	WOOD DOORS, FRAMES, BASE MOLDING TO BE FILLED, STAINED, SEALED AND SHOP FINISHED TO MATCH ARCHITECT'S SAMPLE. WORK SHOULD BE PERFORMED IN A DUST FREE ENVIRONMENT.
R.	UNLESS OTHERWISE INDICATED, PROVIDE PRODUCTS OF QUALITY SPECIFIED BY AWI/AWMAC/WI ARCHITECTURAL WOODWORK STANDARDS FOR CUSTOM GRADE.
S.	RTE: REFER TO INTERIOR ELEVATIONS FOR ADDITIONAL FINISH INFORMATION





STYLE "A"

1 COUNTERTOP STYLES
1 1/2" = 1'-0"

ROOM / FINISH TAG

ROOM NAME

ROOM #	
W	WALL
B	BASE
F	FLOOR

FINISHES LISTED IN ROOM TAG APPLY TO ALL ELEMENTS IN ROOM, UNLESS NOTED OTHERWISE

THE FOLLOWING SYMBOL APPLIES TO FINISHES DIFFERENT FROM THOSE NOTED IN ROOM TAG:

FINISH

FURNITURE PLAN SHEET NOTES

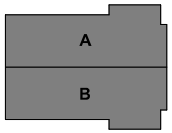
A. ALL FURNITURE SHOWN FOR REFERENCE ONLY. ALL FURNITURE TO BE PROVIDED AND INSTALLED BY OWNER UNLESS NOTED OTHERWISE. FINAL LOCATIONS AND TYPES OF FURNITURE TO BE DETERMINED BY OWNER.
B. PROVIDE AND INSTALL BLOCKING FOR ALL EQUIPMENT AND FIXTURES.

FURNITURE SCHEDULE

MARK	MANUFACTURER	PRODUCT NAME	FINISH	ADDITIONAL INFORMATION	COMMENTS
1	ZOEFTIG	ZINARE LINEAR WITH ARMS	PERFERATED METAL / SILVER ARMS AND BASE	4 SEATS / FLOOR MOUNTED	SOURCED BY CONTRACTOR
2	ZOEFTIG	ZINARE BENCH WITH ARMS	PERFERATED METAL / SILVER ARMS AND BASE	4 SEATS / FLOOR MOUNTED	SOURCED BY CONTRACTOR



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KEYPLAN

1 FURNITURE PLAN
1/16" = 1'-0"

N

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	FURNITURE PLAN	SHEET NO: A1-51 78

PLOT DATE: 5/7/2024 11:42:37 AM PLOT BY: ISG INC. PLOT NAME: AMS PLOT SCALE: AS INDICATED

Branch Panel: P2

Location: Space 11
Supply From: MDP
Mounting: Surface
Enclosure: Type 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10 kAIC
Mains Type: MCB
Mains Rating: 200 A
MCB Rating: 200 A

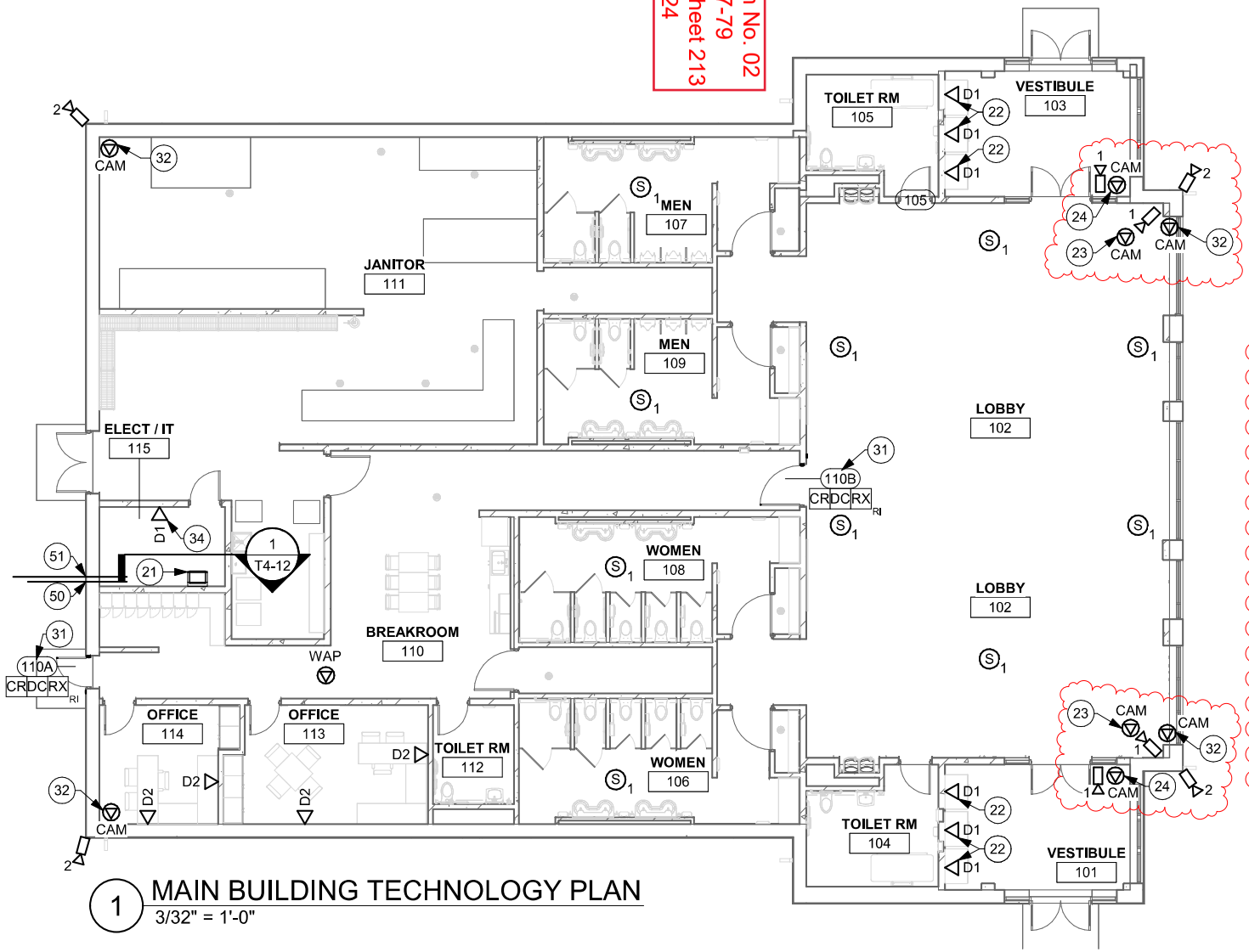
Notes:

CKT	Circuit Description	Trip	Pole	A		B		C		Pole	Trip	Circuit Description	CKT
1	RCPT - GENERATOR	20 A	1	180	500					1	20 A	MECH/BLDG CONTROL PANEL	2
3	LIGHTING	20 A	1			270	1200			1	20 A	GEN ENGINE HEATER	4
5	RCPTS - EAST WALL/EXT.	20 A	1					540	1000	1	20 A	GARAGE DOOR	6
7	GENERATOR BATTERY...	20 A	1	1200	540					1	20 A	RCPTS - NORTH WALL	8
9	EXHAUST FAN	15 A	2			250	540			1	20 A	RCPTS - SOUTH WALL	10
11								250	540	1	20 A	RCPTS - SW WALL/EXTERIOR	12
13	ELECTRIC WATER HEATER (EWH-1)	20 A	3	1500	5000								14
15						1500	5000			3	60 A	ELECTRIC UNIT HEATER (EUH-1)	16
17								1500	5000				18
19	ELECTRIC UNIT HEATER (EUH-2)	60 A	3	5000	360					1	20 A	QUAD RCPT NEAR DATA...	20
21						5000	0			1	20 A	SPARE	22
23								5000	0	1	20 A	SPARE	24
25	BLANK	–	1	–	--					1	--	BLANK	26
27	SEWAGE EJECTOR PUMP	20 A	2			790	–			1	--	BLANK	28
29								790	–	1	--	BLANK	30
		Total Load:		14280 VA		14488 VA		14571 VA					
		Total Amps:		119 A		121 A		122 A					

Legend:

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ID 1071-07-79
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Addendum No. 02
ID 1071-07-79
Revised Sheet 213
May 9, 2024



1 MAIN BUILDING TECHNOLOGY PLAN
3/32" = 1'-0"

SHEET NOTES

1. WALL INFORMATION OUTLETS SHALL BE LOCATED NEXT TO POWER RECEPTACLES. COORDINATE LOCATIONS WITH ELECTRICAL CONTRACTOR PRIOR TO ROUGH-IN
2. ROVIDE QUANTITIES AS REQUIRED BASED ON DEVICE COUNTS. REFER TO FLOOR PLANS AND SPECIFICATION FOR ADDITIONAL INFORMATION.
3. ALL ROUGH-IN BOXES AND CONDUIT SHALL BE RECESSED WHERE POSSIBLE. REFER TO ELECTRICAL PLANS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
4. BACKGROUND MUSIC (BGM) SPEAKERS ARE SHOWN FOR GENERAL DESIGN INTENT. CONTRACTOR SHALL PROVIDE MANUFACTURER RECOMMENDED LAYOUT BASED ON SPECIFIC MODEL SELECTED. REFER TO PUBLIC ADDRESS SYSTEMS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
5. ACCESS CONTROL SYSTEM SHALL BE ROUGH-IN & PATHWAYS ONLY. COORDINATE WITH OWNER FINAL DEVICE LOCATIONS (CARD READER, DOOR CONTACT, & REQUEST TO EXIT) PRIOR TO CONSTRUCTION. REFER TO SINGLE DOOR DETAIL FOR ADDITIONAL INFORMATION.
6. COORDINATE FINAL PLACEMENT OF ALL VIDEO SURVEILLANCE CAMERA LOCATIONS WITH OWNER PRIOR TO INSTALLATION.

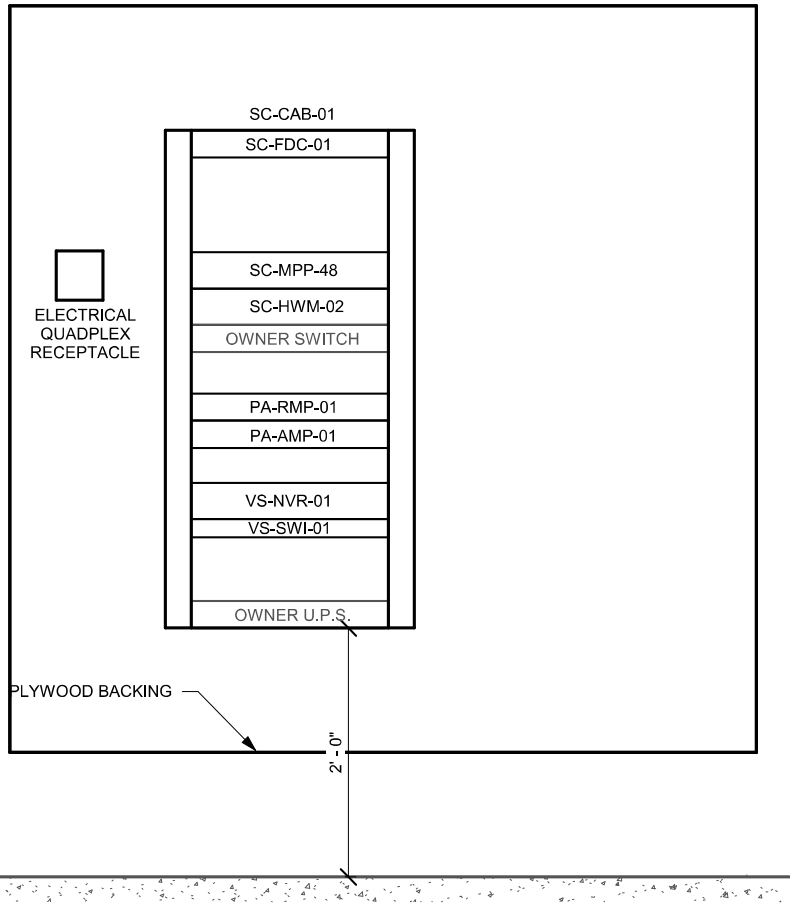
TECH KEYNOTE LEGEND

21	APPROXIMATE LOCATION OF WALL MOUNTED IT CABINET (SC-CAB-01) AND ASSOCIATED IT EQUIPMENT. REFER TO ELEVATION DETAIL FOR ADDITIONAL INFORMATION.
22	WALL INFORMATION OUTLET (D1) FOR OWNER PROVIDED VENDING MACHINE. COORDINATE FINAL OUTLET LOCATION WITH OWNER PRIOR TO ROUGH-IN.
23	CEILING INFORMATION OUTLET (CAM) FOR INTERIOR MOUNTED SECURITY CAMERA. COORDINATE FINAL OUTLET LOCATION WITH OWNER.
24	CEILING INFORMATION OUTLET (CAM) FOR INTERIOR MOUNTED SECURITY CAMERA IN VESTIBULE. COORDINATE FINAL OUTLET LOCATION WITH OWNER.
31	FUTURE ACCESS CONTROLLED DOORWAY. PROVIDE ALL NECESSARY PATHWAYS & ROUGH-INS FOR FUTURE OWNER PROVIDED CARD READER, DOOR CONTACTS, & REQUEST TO EXITS. PROVIDE BLANK PLATES ON BOXES WHERE NECESSARY. COORDINATE WITH OWNER.
32	CEILING INFORMATION OUTLET (CAM) FOR EXTERIOR MOUNTED SECURITY CAMERA. COORDINATE FINAL OUTLET LOCATION WITH OWNER. PROVIDE WEATHERPROOF EXTERIOR JUNCTION BOX AND FIRE PROOFING AS REQUIRED.
34	PROVIDE DATA CONNECTION TO LIGHTING CONTROL PANEL. COORDINATE FINAL LOCATION & ADDITIONAL REQUIREMENTS WITH PANEL PROVIDER PRIOR TO ROUGH-IN & INSTALLATION.
50	PROVIDE (2) 2" CONDUIT FOR INCOMING SERVICE. COORDINATE DIRECTION AND ADDITIONAL REQUIREMENTS WITH OWNER PRIOR TO CONSTRUCTION.
51	PROVIDE (1) 2" CONDUIT TO MAINTENANCE SHED FOR BACKBONE CABLING. COORDINATE DIRECTION AND ADDITIONAL REQUIREMENTS WITH OWNER PRIOR TO CONSTRUCTION.

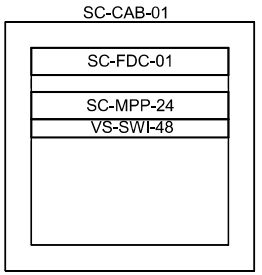
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STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	MAIN BUILDING TECHNOLOGY PLAN	SHEET NO: T2-00 213 E

PLOT DATE: 5/7/2024 3:19:08 PM PLOT BY: ISG INC. PLOT NAME: RDS PLOT SCALE: AS INDICATED



1 MDF - IT 115 - WALL MOUNTED CABINET ELEVATION
1" = 1'-0"

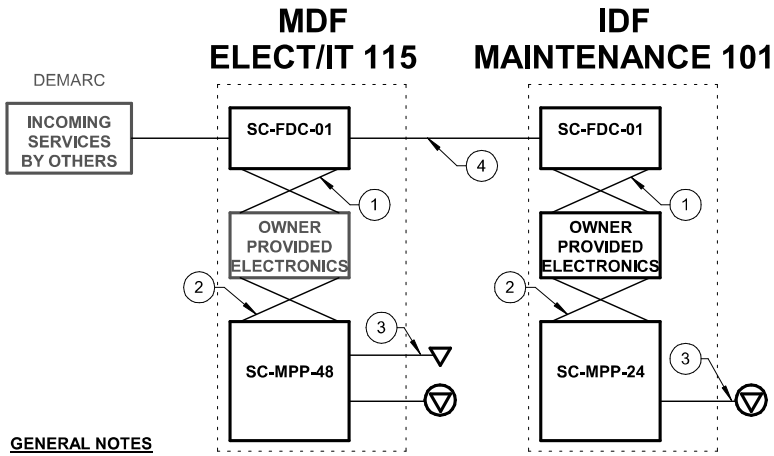


2 IDF - MAINTENANCE SHED
WALL MOUNTED CABINET ELEVATION
1" = 1'-0"

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Revised Sheet 215
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STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	TECHNOLOGY DETAILS	SHEET NO: T4-12 215	E

PLOT DATE: 5/7/2024 3:19:08 PM PLOT BY: ISG INC. PLOT NAME: RDS PLOT SCALE: AS INDICATED



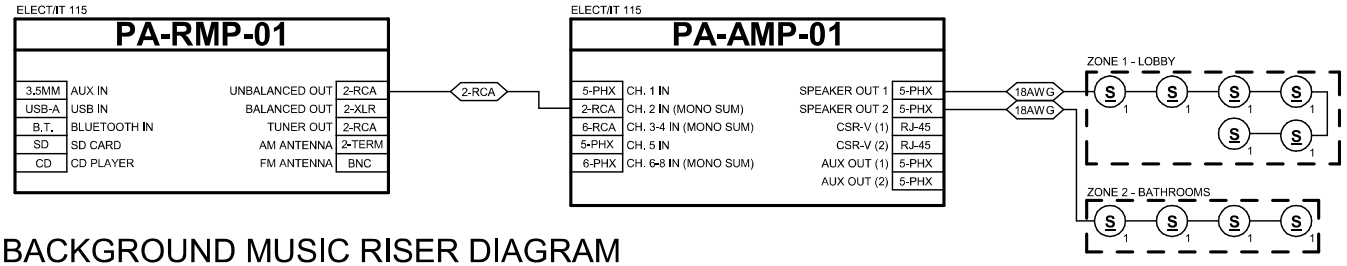
GENERAL NOTES

1. TYPICAL DEVICES SHOWN. REFER TO FLOOR PLANS FOR QUANTITIES AND LOCATIONS
2. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION

KEYNOTES

1. LC-LC FIBER PATCH CORDS BY CONTRACTOR
2. RJ-45 PATCH CORD BY CONTRACTOR.
3. CATEGORY CABLE TO DEVICES BY CONTRACTOR. REFER TO INFORMATION OUTLET CONFIGURATIONS FOR ADDITIONAL INFORMATION.
4. PROVIDE AT MINIMUM SINGLE-MODE OS2 12-STRAND FIBER OPTIC CABLING. PROVIDE NECESSARY EQUIPMENT FOR A FULLY FUNCTIONING SYSTEM. PROVIDE (1) 2" CONDUIT FROM MAIN IT ROOM TO MAINTENANCE SHED. COORDINATE WITH OWNER.

1 DATA RISER DIAGRAM
NOT TO SCALE



2 BACKGROUND MUSIC RISER DIAGRAM
NOT TO SCALE

CABLING TYPES

CABLING TYPE TAG: #####

TAG	CONDUIT
18AWG	(2) 18 AWG CONDUCTORS
2-RCA	STEREO RCA CABLING

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TECHNOLOGY SYMBOLS	
[CR]RI	AC-CR-RI
[DC]RI	AC-DC-RI
[RX]RI	AC-RX-RI
(S)	PA-SPK-01
▽	SC-IO-WALL
▽	SC-IO-CLG
▭◁	SC-CAM-01

VIDEO SURVEILLANCE SCHEDULE

DEVICE	DESCRIPTION	MODEL
VS-CAM-01	M3066 - INDOOR	AXIS M3066
VS-CAM-02	P3727 - OUTDOOR	AXIS P3727
VS-NVR-01	S3016 NVR	AXIS S3016
VS-SWI-48	VIDEO PoE SWITCH	ARUBA

ACCESS CONTROL SCHEDULE

DEVICE	DESCRIPTION	MODEL
AC-CR-RI	CARD READER, ROUGH-IN ONLY	
AC-DC-RI	DOOR CONTACT, ROUGH-IN ONLY	
AC-RX-RI	REQUEST TO EXIT, ROUGH-IN ONLY	

STRUCTURED CABLING SCHEDULE

DEVICE	DESCRIPTION	MODEL
SC-CAB-01	WALL MOUNTED IT CABINET - PROVIDE FAN AND FILTER KIT, ASSOCIATED HARDWARE FOR A FULLY FUNCTIONING SYSTEM	CHATSWORTH PRODUCTS 11840-748
SC-CAB-02	WALL MOUNTED IT CABINET - PROVIDE FAN AND FILTER KIT, ASSOCIATED HARDWARE FOR A FULLY FUNCTIONING SYSTEM	CHATSWORTH PRODUCTS 11900-724
SC-FDC-01	FIBER DISTRIBUTION CABINET 1RU. PROVIDE ADAPTER PANELS AS NECESSARY.	CORNING CCH-01U
SC-HWM-02	HORIZONTAL CABLE MANAGER 2 RACK UNIT, T-SHAPED CABLE GUIDES (FINGERS), SNAP-ON COVER THAT CAN BE HINGED FROM TOP OR BOTTOM.	CHATSWORTH PRODUCTS INC 13930-702
SC-IO-CLG	VARIES	REFER TO INFORMATION OUTLET CONFIGURATIONS FOR ADDITIONAL INFORMATION.
SC-IO-WALL	INFORMATION OUTLET - WALL	REFER TO INFORMATION OUTLET CONFIGURATIONS FOR ADDITIONAL INFORMATION.
SC-MPP-24	24-PORT MODULAR PATCH PANEL	PANDUIT CPPA24FMWWH
SC-MPP-48	48-PORT MODULAR PATCH PANEL	PANDUIT CPPA48FMWWH

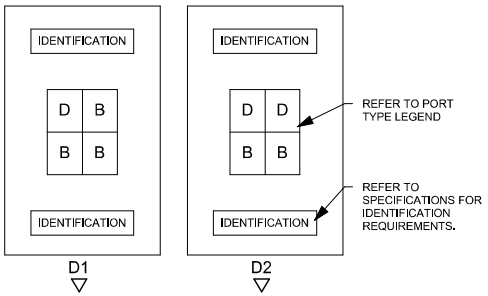
PAGING AND BGM SCHEDULE

DEVICE	DESCRIPTION	MODEL
PA-AMP-01	2-CHANNEL RACK MOUNT AMPLIFIER AND COMMERCIAL MIXER WITH 8 TOTAL INPUTS. LOW-Z AND 70V CAPABLE.	JBL CSMA 2120
PA-RMP-01	RACK MOUNT MEDIA PLAYER WITH UN-BALANCED AND BALANCED AUDIO OUTPUTS, BLUETOOTH RECEIVER, AM/FM TUNER, CD, SD AND USB INPUTS.	DENON DN-300Z
PA-SPK-01	SPEAKER - BACKGROUND MUSIC (BGM) COMPACT IN-CEILING SPEAKER, 80W, LOW-Z AND 70V CAPABLE. IN ADDITION TO SPEAKER, PROVIDE ALL NECESSARY PARTS AND ACCESSORIES FOR MOUNTING TO GYPSUM CEILING. CONTRACTOR TO VERIFY LOUD-SPEAKER CATALOG NUMBER AND INSTALLATION REQUIREMENTS PRIOR TO ORDERING. PROVIDE MANUFACTURER RECOMMENDED CABLING BASED ON POWER AND DISTANCE OF FINAL CONFIGURATION.	JBL CONTROL 24CT

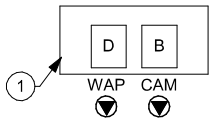
Addendum No. 02
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INFORMATION OUTLET CONFIGURATIONS

WALL MOUNTED INFORMATION OUTLET



CEILING SURFACE MOUNT BOX INFORMATION OUTLET



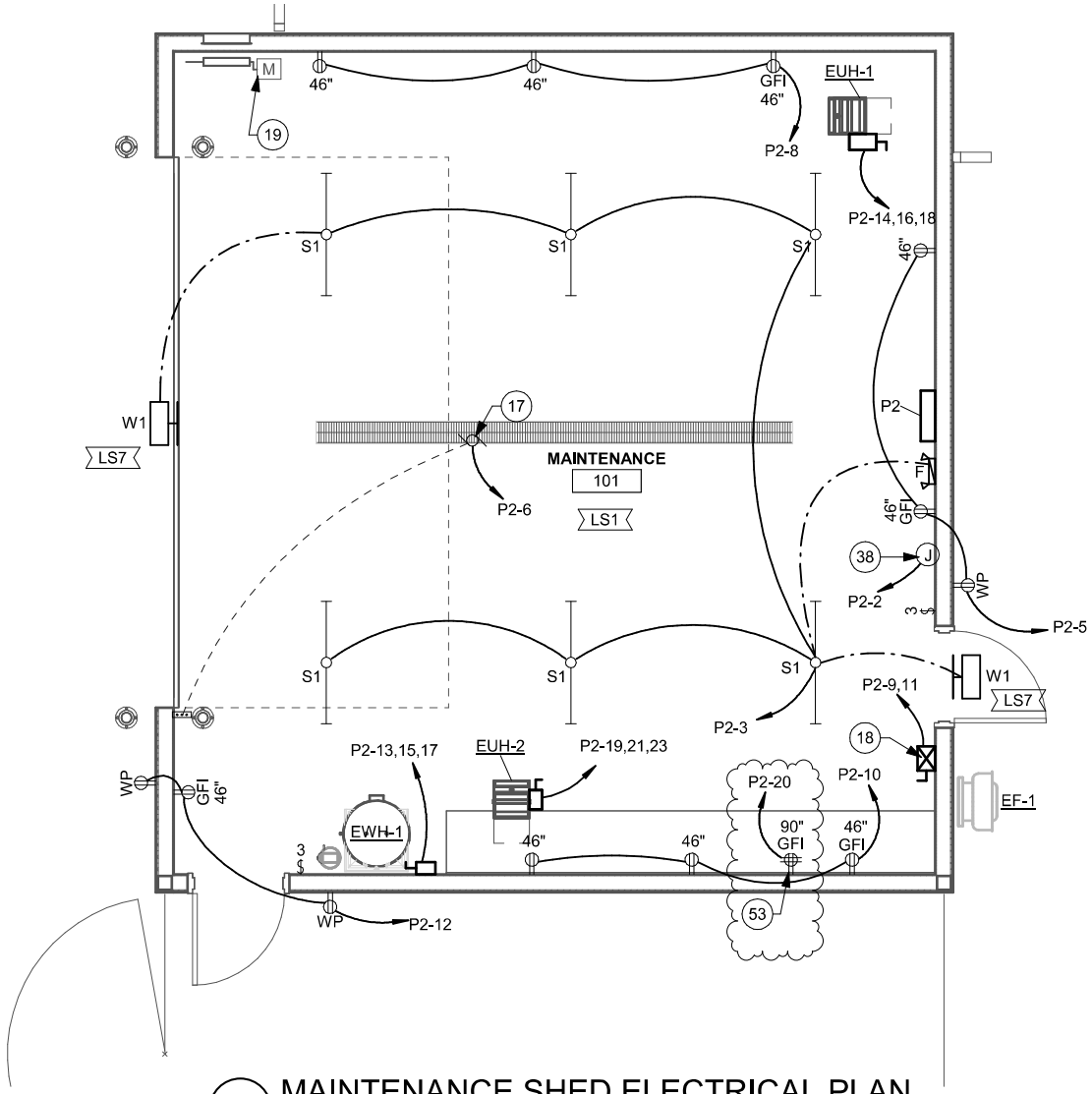
PORT TYPE LEGEND	
(B) BLANK	FILLER MODULE
(C) COAX	F-CONNECTOR
(D) DATA	CAT6 TO MDF/IDF
(H) HDMI	HDMI FEMALE JACK

NOTES:

1. PROVIDE REMOVABLE BLANK (B) INSERTS FOR ALL UNUSED PORTS.

KEYNOTES:

(1) LOCATION OF CEILING OUTLET FOR WIRELESS ACCESS POINTS OR CAMERA. PROVIDE 15' OF SLACK LOOP COIL AT NEAREST CABLE SUPPORT FOR FUTURE RELOCATION AS REQUIRED.



1 MAINTENANCE SHED ELECTRICAL PLAN
1/4" = 1'-0"

SHEET NOTES

1. ALL 15A & 20A CONVENIENCE RECEPTACLES INSTALLED WITHIN PUBLIC SPACE SHALL BE TAMPER RESISTANT.
2. MAINTAIN FIRE RATING OF ALL WALLS AND FLOORS. PROVIDE FIRE PROOFING FOR ALL WALL AND FLOOR PENETRATIONS PER CODE.
3. COORDINATE WORK WITH OTHER TRADES.

ELECTRICAL KEYNOTE LEGEND

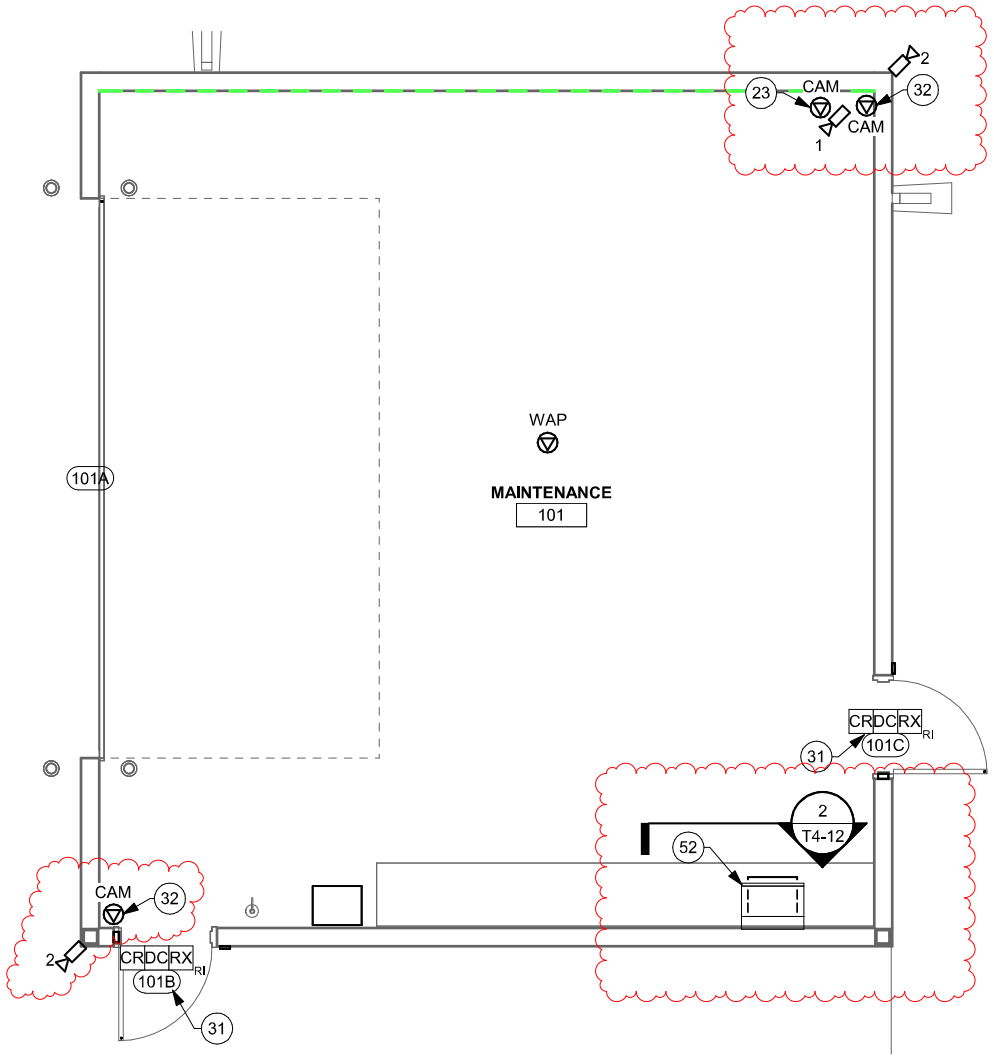
17	PROVIDE CIRCUIT TO OVERHEAD DOOR MOTOR AND MAKE CONNECTIONS TO REMOTE SWITCH AND PHOTOEYES. ALL CABLING TO BE INSTALLED WITHIN CONDUIT.
18	F&I COMBINATION MOTOR STARTER DISCONNECT FOR EXHAUST FAN. CONNECT TO CO/NO CONTROLLER. ACTIVATION OF CONTROLS SHALL ENERGIZE EXHAUST FAN. VERIFY COIL VOLTAGE WITH MECHANICAL PROVIDED CONTROL PANEL.
19	PROVIDE AN UNSWITCHED HOT TO MOTORIZED DAMPER FROM NEARBY AVAILABLE CIRCUIT. INTERLOCK DAMPER WITH EF-1.
38	PROVIDE CIRCUIT TO MECHANICAL CONTROL PANEL. VERIFY LOCATION OF PANEL WITH CONTROLS CONTRACTOR.
53	PROVIDE QUADRUPLEX RECEPTACLE FOR WALL MOUNTED NETWORK RACK LOCATION. CONFIRM RACK LOCATION AND MOUNTING HEIGHT WITH SYSTEM INTEGRATOR.

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ID 1071-07-79
Revised Sheet 254
May 9, 2024

N

STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	MAINTENANCE SHED ELECTRICAL PLAN	SHEET NO: G-E2-13 254	E

PLOT DATE: 5/7/2024 1:31:38 PM PLOT BY: ISG INC. PLOT NAME: RDS PLOT SCALE: AS INDICATED



1 MAINTENANCE SHED TECHNOLOGY PLAN

1/4" = 1'-0"

SHEET NOTES

1. WALL INFORMATION OUTLETS SHALL BE LOCATED NEXT TO POWER RECEPTACLES. COORDINATE LOCATIONS WITH ELECTRICAL CONTRACTOR PRIOR TO ROUGH-IN
2. ROVIDE QUANTITIES AS REQUIRED BASED ON DEVICE COUNTS. REFER TO FLOOR PLANS AND SPECIFICATION FOR ADDITIONAL INFORMATION.
3. ALL ROUGH-IN BOXES AND CONDUIT SHALL BE RECESSED WHERE POSSIBLE. REFER TO ELECTRICAL PLANS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
4. BACKGROUND MUSIC (BGM) SPEAKERS ARE SHOWN FOR GENERAL DESIGN INTENT. CONTRACTOR SHALL PROVIDE MANUFACTURER RECOMMENDED LAYOUT BASED ON SPECIFIC MODEL SELECTED. REFER TO PUBLIC ADDRESS SYSTEMS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
5. ACCESS CONTROL SYSTEM SHALL BE ROUGH-IN & PATHWAYS ONLY. COORDINATE WITH OWNER FINAL DEVICE LOCATIONS (CARD READER, DOOR CONTACT, & REQUEST TO EXIT) PRIOR TO CONSTRUCTION. REFER TO SINGLE DOOR DETAIL FOR ADDITIONAL INFORMATION.
6. COORDINATE FINAL PLACEMENT OF ALL VIDEO SURVEILLANCE CAMERA LOCATIONS WITH OWNER PRIOR TO INSTALLATION.

TECH KEYNOTE LEGEND

23	CEILING INFORMATION OUTLET (CAM) FOR INTERIOR MOUNTED SECURITY CAMERA. COORDINATE FINAL OUTLET LOCATION WITH OWNER.
31	FUTURE ACCESS CONTROLLED DOORWAY. PROVIDE ALL NECESSARY PATHWAYS & ROUGH-INS FOR FUTURE OWNER PROVIDED CARD READER, DOOR CONTACTS, & REQUEST TO EXITS. PROVIDE BLANK PLATES ON BOXES WHERE NECESSARY. COORDINATE WITH OWNER.
32	CEILING INFORMATION OUTLET (CAM) FOR EXTERIOR MOUNTED SECURITY CAMERA. COORDINATE FINAL OUTLET LOCATION WITH OWNER. PROVIDE WEATHERPROOF EXTERIOR JUNCTION BOX AND FIRE PROOFING AS REQUIRED.
52	APPROXIMATE LOCATION OF WALL MOUNTED IT CABINET (SC-CAB-02) AND ASSOCIATED IT EQUIPMENT. REFER TO ELEVATION DETAIL FOR ADDITIONAL INFORMATION. COORDINATE FINAL LOCATION WITH OWNER AND TRADES PRIOR TO INSTALLATION.

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ID 1071-07-79
Revised Sheet 255
May 9, 2024

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STATE PROJECT NUMBER: 1071-07-79	HWY: IH 90	COUNTY: MONROE	MAINTENANCE SHED TECHNOLOGY PLAN	SHEET NO: G-T2-13 255 E

PLOT DATE: 5/7/2024 3:19:04 PM PLOT BY: ISG INC. PLOT NAME: RDS PLOT SCALE: AS INDICATED